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INTERPRETATION OF THE SEROLOGIC TEST FOR SYPHILIS*

R. H. KAMPMEIER, M. D.†
NASHVILLE, TENNESSEE

Without fear of contradiction it may be said that the most difficult problem facing the physician in the field of syphilis is the interpretation of serologic tests as these relate to diagnosis. The blood tests are of inestimable value in determining the incidence of syphilis in the population and in case finding, particularly in that great majority of patients who are in the latent stage. However, in the evaluation of a positive reaction in the individual patient it loses its statistical feature and involves at times a nicety of judgment which taxes the physician to the utmost.

For more than a decade blood tests for syphilis have become commonplace in examinations for marriage, foodhandlers, and in industry. It is certain that no physician has escaped the problem of making the decision as to whether a positive reaction in a given person justifies a diagnosis of syphilis or whether it is a false positive test. It is a foregone conclusion that hundreds of thousands of persons have received antisyphilitic treatment because of one positive or doubtful test, a diagnosis of syphilis having been erroneous.

At the present time, the ease with which syphilis may be treated by penicillin and the relative innocuosness of such treatment has led to great carelessness in the proper evaluation of the positive blood test. I shudder at the flippancy with which doctors justify their course of action in the face of positive blood tests of unknown significance. Their reasoning so often follows a line I have heard expressed to me verbally, "Maybe the positive blood tests do not mean syphilis, but I don't know; and giving some penicillin isn't going to hurt the patient. So I am going to treat them." Such malpractice seems a simple answer, but the experienced physician will agree when I warn concerning the far reaching serious consequences of making a diagnosis of syphilis. Granted, in many there is no mental trauma, but the consultant who has interest in syphilis can cite example upon example in which the diagnosis of syphilis has left a mental scar which cannot be eradicated either by the passage of years or by the repeated reassurance of physician after physician. The embarrassment and guilt, and the phobia of possible late manifestations of syphilis, so frequently discussed in the lay press and magazines, are so impressive that many patients can never shake themselves loose from fear. After repeated negative spinal fluid examinations, some of these patients still go from doctor to doctor begging for "just one more" lumbar puncture in order to be reassured that no disease is present in the nervous system. Time and again, I have refused to perform another lumbar puncture after the patient has shown me negative reports from good laboratories. Time and again, one sees a patient who has been adequately treated for syphilis, or who

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†From the Department of Medicine, Vanderbilt University, School of Medicine, Nashville, Tennessee.

possibly did not have syphilis, who goes from doctor to doctor, year in and year out begging for treatment saying, "I have bad blood and syphilis but never had very much treatment and want more treatment." (This occurs in the late latent, serofast syphilitic as well as in the ones who have had false positive tests.)

Since this is the picture, the diagnosis of syphilis must not be given lightly, to be shrugged off with penicillin which "will do no harm." It must be emphasized that it is not the treatment which does the harm,—it is the diagnosis which is the serious thrust. So often the patient who has the false positive test is not a promiscuous individual (he may have had only one sexual experience with a deep sense of guilt) and he is therefore least likely to shrug off the diagnosis of syphilis. Imagine then the results in such a patient who, having had a biologically false positive blood test and a diagnosis of syphilis, has received penicillin therapy. If it is an inherently false positive test which he carries with him all his life, and repeated tests are done he is almost certain to anticipate the late manifestations of syphilis and to feel that his treatment was ineffectual. If the patient had a false positive test because of intercurrent infection or other reason, which will appear later, and receives penicillin and subsequently is seronegative, he will carry with him always the fact that he had a diagnosis of syphilis. The moral connotation and guilt, even though the blood is negative, may be with him always.

It is quite obvious, therefore, that the physician who makes the diagnosis of syphilis on the basis of a positive blood test alone, without giving any thought to the patient's background, to his past history of promiscuity or absence of sexual exposure, the familial background and other factors, may be setting off iatrogenic disease from which the patient may never recover. The physician may thereby color the patient's life and actions for the remainder of his life. Marriage plans may be postponed; pregnancies may be avoided; anxiety states and psychoneuroses be established for life.

On the other hand, what of the status of the test in the patient who has syphilis. All too frequently a physician may disregard a doubtful test as being of no significance; whereas some careful history taking and physical examination may reveal that it is indicative of the presence of disease. This doubtful test properly evaluated may prevent future disability through treatment. It may give the clue to syphilis of the central nervous or cardiovascular system.

NATURE OF THE SEROLOGIC TESTS

There are two types of tests used in the serodiagnosis of syphilis. The first and original complement fixation test, the Wassermann reaction, is used as the Kolmer or Eagle modification. Years after the introduction of this reaction, flocculation reactions came into use because of their greater ease and rapidity of performance. These are the Kline, Mazzinni, Eagle, Hinton, Kahn, and VDRL tests. All tests for syphilis are dependent upon the use of an antigen prepared from beef heart and thus bear no relationship to the infecting organism. The several tests vary in the preparation of the antigen. The most recent addition to the group is the VDRL test (Venereal Disease Research Laboratory) utilizing the cardiolipin antigen which is supposed to have increased sensitivity without loss of specificity. The antibody of the blood which reacts with the antigen is not known; it has been designated for years by the term "reagin".

Kahn,[1] with current studies, may be on the road to clarifying the mechanism involved in the serologic tests for syphilis. He has found that all persons in health show a serologic response which he calls the *universal reaction* (present in all warm blooded animals). This universal reaction may undergo changes in the presence of disease and extraneous factors, such as the injection of foreign substances or by irradiation, returning to normal upon recovery. It seems the universal reaction is a lipid antigen-antibody reaction suggesting a sim-

ilarity between it and the serodiagnostic test used for syphilis.

Kahn feels that in normal catabolism lipids released from dying cells render them foreign or antigenic to the body. In health this catabolic process, with its antigenic lipids and the resulting antibodies, is constant, accounting for the consistent serologic pattern of an individual during health month after month. A pattern of lipid antigen-antibody reactivity is not limited to the serodiagnosis of syphilis, occurring also in malaria, yaws, leprosy, tuberculosis, and cancer. With improvement from disease the universal reaction changes more towards the normal pattern.

Tests for the universal reaction are set up similarly to the quantitative Kahn test except that the test is carried out with different dilutions of sodium chloride solutions. Precipitation results are read at the end of the test, again after refrigeration at 5°C, at four and at twenty-four hours. Normal individuals vary in the degree of precipitation in the various dilutions. Those individuals who have a tendency to false positive reactions in the tests for syphilis are persons who have universal reactions of marked degree. Thus, if an individual gives a precipitation in the universal reaction without incubation in the quantitative set-up with 0.9 per cent sodium chloride, a false positive reaction will appear when a serodiagnostic test for syphilis is done with this blood.

It is Kahn's belief that the Kahn antigen and alcoholic extract of beef heart contain many different antigenic lipids with which different antibodies may react, syphilitic antibodies reacting only with their homologous lipids, those of leprosy with theirs, and so on. The universal reaction, a new concept in the field of serodiagnosis, provides an understanding of both serologic testing and the false positive reactor.

In the evaluation of any test two features are to be considered,—(1) the sensitivity and (2) the specificity of a test. *Sensitivity* maye be defined as the percentage of true positive reactions in bloods of known syphilitic donors. *Specificity*, on the other hand, is that percentage of negative reactions on bloods from presumably nonsyphilitic persons. Laboratories using the same tests vary greatly in the results obtained. Under the auspices of the U. S. Public Health Service periodic nationwide evaluation of state laboratories along with the laboratories of the original investigators are carried out. In general the tests are found to be highly specific. Though it might seem that the incidence of false positive tests would be low, this is not true, since in this type of evaluation the nonsyphilitic bloods outweigh the syphilitic, and thus, the high specificity may be more reassuring than actual.

With increased sensitivity there is a loss of specificity. Kahn in emphasizing that high specificity is more important than sensitivity gives the following hypothetical example. If 40,000 hospital admissions had 1200 cases of treated or untreated syphilis among them, an increase of 1 per cent sensitivity would pick up 12 additional cases of treated or untreated syphilis. On the other hand, if there is a 1 per cent increase in nonspecificity there would be 400 nonsyphilitic patients who would be reported as positive. High sensitivity, therefore, indicates the shortcomings of the sensitive so-called "exclusion" and "presumptive" tests, which were advanced as screening only and not as diagnostic tests.

Usually flocculation tests are more sensitive than the complement fixation tests, though the latter are likely to be more specific. (Therefore more errors occur in the use of flocculation than with complement fixation tests.) With a small amount of antibody present a positive test is more likely with the flocculation reaction than a complement fixation test. There is a small group of patients, however, in which there is the paradoxical finding of a positive complement fixation test even though the precipitation test is negative. This occurs more often in the late or treated case.

Another fact difficult of understanding is the finding of a wide discrepancy at times in the results in several tests (as Kahn, Kline and VDRL) with the same

specimen of blood. This does not necessarily mean that the blood is falsely positive, and syphilis cannot be ruled out on this basis as is done by some physicians. Strongly positive bloods react with all antigens in the battery of tests. Nevertheless, in weakly positive sera as well as in falsely positive sera the results may be irregular. Thus some weakly positive syphilitic sera may react consistently with one or more of a battery of tests; whereas others may not react in this way.

Serial dilutions may be used in the evaluation of complement fixation and flocculation tests for *quantitative usage*. The quantitation of tests may be important not only diagnostically in syphilis, but also in the diagnostic evaluation of false positive tests. The quantitative tests also are of great value in the evaluation of short-term treatment as will appear below.

SEROLOGIC TESTS IN SYPHILIS

1. After the appearance of the *chancre* there is a phase during which the blood tests are negative, — the seronegative stage of primary syphilis, a time during which the lipid antigen-antibody reaction is at a subthreshhold level. (Here the darkfield examination is the diagnostic tool.) In most instances by the time the chancre has been present for about two weeks the blood tests will begin to become positive. At first the more sensitive flocculation tests become positive, to be followed some days later by positive complement fixation tests. Rarely, the blood may remain seronegative even as long as a month after the appearance of the primary lesion.

2. The *secondary stage* of syphilis is characterized by positive complement fixation and flocculation reactions in 100 per cent of instances, and with all tests if a battery of tests is used. The diagnosis of secondary syphilis cannot be made in the presence of repeated (to rule out laboratory error) negative blood tests no matter how certainly a rash may suggest secondary syphilis.

3. *Late syphilis* is not characterized by any consistency in blood tests either negative or positive, or on a quantitative basis. It is true that late benign lesions, such as gummas of bone, skin, and the like practically always show positive reactions both with the complement fixation and flocculation tests, though at times one may encounter a doubtful reaction in either or both. This is to be expected in light of Kahn's studies. Gummas, being accompanied by destruction of tissue, would be expected to liberate antibody stimulating lipids. On the other hand, in the presence of the minimal lesions of aortitis, negative blood tests are encountered not too infrequently, though pathologic studies in such instances may reveal active inflammation in the aortic wall. In the case of late neurosyphilis the reactions are variable. Tabes dorsalis notoriously is accompanied by negative serologic reactions in as many as a third of the patients consulting the physician because of clinical manifestations, and this in the absence of previous treatment. With the more widespread parenchymatous involvement of general paresis, one anticipates and finds almost universally strongly positive reactions for syphilis in the blood. During the early years of symptomless infection the reacting substance is present in such quantity that all the tests applied will be found to be positive. As the years pass and the titer drops, either the complement fixation or flocculation test or both are completely negative. As in tabes dorsalis and in cardiovascular syphilis, so too in late asymptomatic neurosyphilis, the blood may be negative though the spinal fluid is positive.

Table 1 summarizes what may be anticipated in the various stages of syphilis in positivity and in titer of the quantitative test, thereby expressing the degree of positivity which may be encountered as well as negative reactions. Diminishing titer commonly is progressive with the years. But in addition, it is shown that in manifestations of late syphilis, in which there is parenchymatous involvement and probably more tissue breakdown and liberation of antigenic lipids, the blood tests will be

TABLE 1
POSITIVE BLOOD IN UNTREATED SYPHILIS

CLINICAL STATE	PERCENT	KAHN UNITS (APPROXIMATE)
Seronegative primary	0	0
Seropositive primary	100	4 - 120 or more
Secondary, early	100	80 - 1280 or more
Secondary, late	100	20 - 240 or more
Early latency	100	20 - 80
Late latency	?	4 - 10 or more
Late benign	98	4 - 80
Cardiovascular	85	0 - 20
Neurosyphilis*		
Acute meningitis	100	as in secondary stage
Early asymptomatic	100	as in secondary stage
Late asymptomatic	?	0 - 120
Meningovascular	?	0 - 120
Tabes dorsalis	66	0 - 120
General paresis	98-100	40 - 120 or more

*The higher blood Kahn titers are present if the spinal fluid is "active" in terms of increased cells, elevated protein and first zone colloidal curve.

found to be of higher titer,—as in gummas of viscera and in paresis.

Treatment, of course, may modify the reactions a great deal. This is quite obvious in early cases and hardly needs mention, since everyone is familiar with the fact that adequate treatment in the primary or secondary case will eventuate in most instances in a negative blood. If therapy so controls the disease that there is no further stimulation to antibody formation the titer drops and eventually becomes negative. On the other hand, if the disease has been established for such a long period of time that antibody production has become constant, the blood may remain positive in spite of treatment (in possibly some 70 per cent of late cases) resulting in so-called serofastness. Of course it is well known by now that adequate treatment may eventuate in a good clinical result, in that the patient never develops late manifestations though the blood remains serofast. No further treatment is necessary in such cases since *one does not treat a blood test.*

In the days of prolonged treatment of syphilis, qualitative tests were adequate since the bloods of patients with early syphilis were found gradually to reach the negative level in from two to six or even more months after treatment was begun. After therapy was completed and seronegativity attained, one anticipated a 12 to 15 per cent failure rate in terms of serorelapse or infectious relapse. With the use of rapid treatment methods it is obvious that treatment is completed before antibody production ceases. Rapid treatment therefore demands a means whereby the clinician will know whether treatment has been satisfactory, and that the subsequent course of the patient is one of improvement or one of serorelapse. The quantitative evaluation of syphilitic blood thus became essential.

The seronegative primary case of syphilis should remain negative during treatment and subsequently. In some instances the blood may become positive for a brief period after the institution of treatment since some antibodies were formed. They would have led to a positive test very shortly; treatment probably set free more antigen and therefore stimulated a rise in antibodies. (See Fig. 1) Here, however, the blood should promptly return to a seronegative level. In seropositive primary and in secondary syphilis the definitely positive serologic tests should become negative, as in the days of chemotherapy, in six months more or less. If, subsequent to treatment, the quantitative tests reveal a constantly dropping titer, the physician may be satisfied. However, if he finds that the titer does not drop to low levels, the progress of the case is unsatisfactory and retreatment may be necessary. Another type of unsatis-

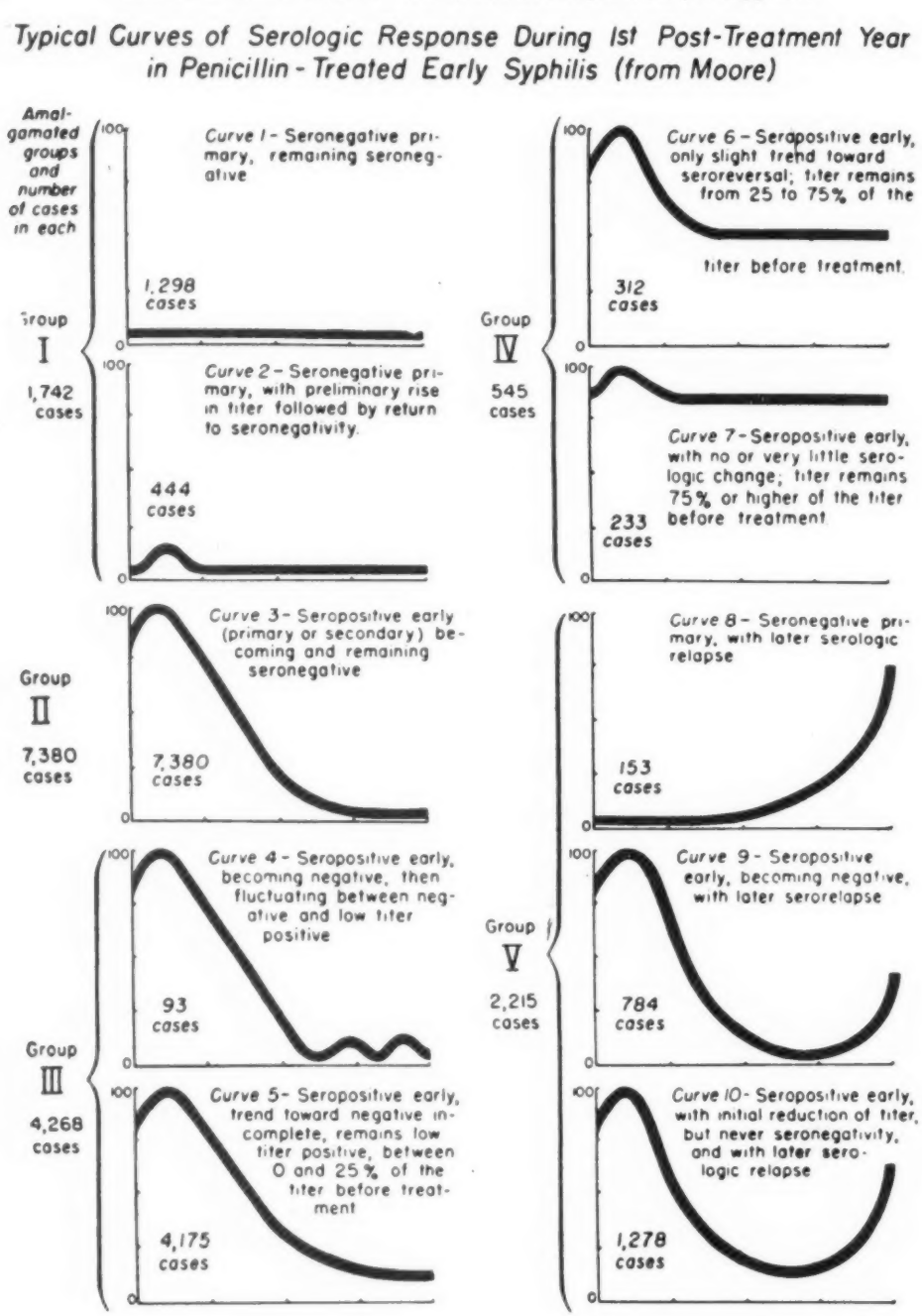
Typical Curves of Serologic Response During Ist Post-Treatment Year in Penicillin-Treated Early Syphilis (from Moore)
Amalgamated groups and number of cases in each
Group I
1,742 cases
Curve 1 - Seronegative primary, remaining seronegative
1,298 cases
Curve 2 - Seronegative primary, with preliminary rise in titer followed by return to seronegativity.
444 cases
Group II
7,380 cases
Curve 3 - Seropositive early (primary or secondary) becoming and remaining seronegative
7,380 cases
Group III
4,268 cases
Curve 4 - Seropositive early, becoming negative, then fluctuating between negative and low titer positive
93 cases
Curve 5 - Seropositive early, trend toward negative incomplete, remains low titer positive, between 0 and 25% of the titer before treatment
4,175 cases
Group IV
545 cases
Curve 6 - Seropositive early, only slight trend toward seroreversal; titer remains from 25 to 75% of the titer before treatment.
312 cases
Curve 7 - Seropositive early, with no or very little serologic change; titer remains 75% or higher of the titer before treatment.
233 cases
Group V
2,215 cases
Curve 8 - Seronegative primary, with later serologic relapse
153 cases
Curve 9 - Seropositive early, becoming negative, with later serorelapse
784 cases
Curve 10 - Seropositive early, with initial reduction of titer, but never seronegativity, and with later serologic relapse
1,278 cases
100
0
The vertical line represents the STS titer. This is arbitrarily shown in range 0 to 100 to distinguish between high and low titer tests. The horizontal line indicates time after treatment, the length of the line representing one year. The curves are schematic.

Figure 1.—From Symposium on Current Progress in the Study of Venereal Disease, U. S. Public Health Service, 1949.

factory response is one in which the blood level has either reached a negative level, or a low titer, and then begins to rise. This represents *serorelapse* and occurs probably in some 6 to 10 per cent of adequately treated cases of secondary syphilis. Figure 1 illustrates these items graphically, showing the serologic response in 16,150 cases studied in the Central Statistical Unit for cooperative study on the use of penicillin. (Our own cases studied at Vanderbilt University Hospital provide a portion of these cases.)

One phase of the serologic tests, in either the late untreated patient, or more commonly in the treated case, which bothers the clinician is the fluctuating results of blood tests from time to time. As the result of such fluctuation some patients unfortunately are unnecessarily re-treated, sometimes over and over and over again. By variation or fluctuation in the serologic test I mean that the patient occasionally may have a doubtful test, again a positive test and occasionally a negative test. This is very frequent in the treated syphilitic patient. For many years it was accepted that this probably represented varying amounts of "reagin" or antibody in the blood stream possibly dependent upon activity, now and then, in syphilitic foci. Though this may be true at times it probably is uncommonly so, and there are better explanations for such fluctuations in tests or titer.

It has been shown that these variations do not represent a fluctuation in antibody titer but actually are a reflection of the variations in antigen sensitivity which occur daily in the laboratory. This has been proven by such studies as splitting each sample of blood from a given patient taken over a six-month period, testing half of the sample at once and quick freezing the other half. At a later date all the frozen samples accumulated over a six-month period were tested at one time. Though the samples which were examined upon being drawn represented fluctuations from negative to positive, all those saved for six months and examined on one day consistently were either negative, positive or doubtful.

I would speculate on another possibility in light of Kahn's universal reaction. Recalling the pattern of the universal reaction of the potential false reactor and of the syphilitic patient, it seems very possible that, after improvement in the latter, though there is a drop in the reaction in the range of the 0.6 to 1.2 per cent sodium chloride concentration, he does not reach the normal level. It is here that intercurrent disease and other factors—(immunizations etc.) might cause a temporary rise of the lipid antibody to above the threshhold level where it will respond in the usual manner. In other words, it might represent a false positive test temporarily because of some intercurrent infection or other antibody stimulating factor. This would explain a fact long known, that antibody formation (anamnestic reaction) may occur in treated syphilitics under the stimulus of specific and nonspecific antigens,—foreign proteins, such as typhoid vaccine, milk, malarial parasites and even by the hypertherm.

FALSE POSITIVE REACTIONS

As was pointed out earlier, the serologic tests for syphilis are extremely helpful as a screening mechanism in mass surveys. When one applies the reaction to the individual patient, the problem at times is not nearly so simple. It is here that a doubtful or a positive reaction, in a person with no history of syphilis or clinical evidence of disease, offers the physician his most serious problem in the field of syphilis. I say this advisedly since it is a much more difficult matter to settle than are treatment, treatment reactions and diagnostic features in clinical syphilis.

This whole question actually was opened up only fifteen years ago when mass surveys began. The seriousness of this problem of the positive blood test is well shown in several studies. Zellermayer,[2] for ex-

ample, in a study of 5,000 army inductees with a diagnosis of syphilis on the basis of positive blood tests reclassified 570 or 11.4 per cent as being nonsyphilitic. A positive blood test had been present in these cases and subsequent study eventually revealed consistent seronegativity. Shaffer[3] found in a group of 150 military separatees, without a history of syphilis or antisyphilitic therapy, no evidence of syphilis except a positive blood test at the time of discharge. He proved 43 per cent as being nonsyphilitic, 40 per cent continuing to show conflicting tests. In only 17 per cent could he establish a diagnosis of syphilis. Similar reports came from other students of the disease. Stokes and James[4] point out that biologic false or nonspecific positives may approach 40 per cent in a series of routine positive tests, though probably make up only 1 in 700 of serologic surveys including negatives as well as positives.

False positive tests may be encountered for a variety of reasons.

1. *Errors in technic.* As long as human beings handle, label and identify blood specimens and the results of tests there will be errors. In any clinic where numbers of bloods are drawn, it is almost certain that at some time the blood sample and the requisition slip will be mismatched. In the laboratory there are technical errors which should not, but are almost certain to, occur at one time or another. Glassware not chemically clean may be a cause of false positive tests. More commonly they are a reflection of the technician's errors in reading results. This is especially true of beginners who tend to report more doubtful tests since they fear they may not recognize frankly positive reactions. Then there is the potent source of error which results from the antigens themselves, since batches of antigen vary one from the other.

2. *False positive tests in normal persons.* From the discussion of Kahn's universal reaction, it was learned that all warm-blooded animals have a positive reaction in sodium chloride concentrations which are utilized in doing the Kahn test. Furthermore, a certain proportion of human beings have higher reactions in certain concentrations. Thus it is quite obvious that an occasional person will give a reaction with the saline concentration used in performing the routine tests, and it would seem that such an individual would need only a slight stimulus of infectious or of other nature to accentuate his reaction in the critical salt dilution. It is fortunate for the value of the serologic test for syphilis that those persons who are potentially false reactors constitute a small percentage of the population. This may even be a familial trait.[5] It is estimated from past studies that this group may be as small as less than 1 per cent of the population. However, the fact that such biologic false positive reactions do occur must be in the physician's mind, when he is faced by a positive reaction in an individual who is otherwise healthy and whose history reveals no possible exposure to syphilitic infection.

Case No. 1.—A 29 year old nurse had the following findings: From 1936 to 1939 she had negative tests every six months, required at place of employment. In 1940 at the Mayo Clinic the Kahn, Kline, Hinton were positive. The spinal fluid was negative. At Vanderbilt University Hospital the following were found:

	WASSERMANN	KAHN
September 1944	Pos.	Dbtf.
October 1944	Neg.	Dbtf.
October 1944	Pos.	Dbtf.
March 1945	Neg.	Neg.
March 1945	Dbtf.	Dbtf.
November 1945	Pos.	Dbtf.
November 1945	Pos.	Dbtf.

In October 1944, Kahn's Laboratory reported the verification test as "general biologic—false positive".

Comment. The patient was classified as having biologic false positive tests.

Case No. 2.—A 19 year old white woman gave no history of syphilis, or of premarital or extramarital exposure. There were no stigmata of congenital syphilis. Her 12 siblings and the parents were living and well. The following tests were obtained on the ward and in the clinic of Vander-

bilt University Hospital. Antisyphilitic therapy was never used.

	Wassermann	Kahn
January 28, 1944	Neg.	Neg.
May 2	Neg.	Neg.
October 10	Neg.	Pos.
Healthy child born		
December 2	Neg.	Pos.
December 12	Neg.	Pos.
January 3, 1945	Neg.	4 units
January 13	Neg.	Pos.
February 2	Neg.	Pos.
February 2		Pos. (Tenn. State Lab.)
February 22	Neg.	4 units
March 29	Neg.	4 units
April 19	Neg.	Pos.
May 17	Neg.	Pos.
Verification test—"False positive" (Kahn's Lab.)		
July 19	Neg.	Pos.
October 9	Neg.	Neg.
October 9		Neg. (Tenn. State Lab.)
February 9, 1946	Neg.	Dbt.
June 6	Neg.	Neg.
June 20	Neg.	Dbt.
November 21	Pos.	3 units
February 20, 1947	Neg.	0 units
April 10	Neg.	0 units

Comment. This is an example of an inherent biologically false positive test.

3. *False positive tests in nonsyphilitic diseases.* In the routine use of serologic tests for syphilis in persons who are ill, it must be constantly in mind that the disease process in itself may be the cause of a false positive test. Major diseases which can give false positive tests in most instances distinguishable from the *T. pallidum* morwill fall into the protozoan or viral groups. Rickettsial infection (typhus) may also lead to seropositive tests, but bacterial infections rarely do so. In addition there are a number of miscellaneous pathologic conditions which may provoke a false positive test.

Diseases due to protozoan infection. Three diseases, having positive tests for syphilis, found in the tropics but of no interest to the physician within the confines of the United States are yaws, pinta, and bejel, each due to a spirochete which is inphologically. Two other tropical diseases, kala-azar and trypanosomiasis, also may show positive reactions.

In this country there are several protozoan diseases which, though not common, may be encountered by any of us in our practice at some time. *Relapsing fever* is a spirochetal disease occasionally encountered in some sections of the country; positive reactions occur in a large percentage of instances. Weil's disease, or *spirochetal jaundice*, is another encountered more frequently in our practice and showing a high incidence of false positive tests. Similarly, positive tests have been reported in *rat-bite fever* whether due to the *Spirillum muris* or to the *Streptothrix muris-ratti* (not protozoan).

A protozoan disease of greater significance to us in the South is that of malaria which has been shown repeatedly to give rise to false positive reactions. This was first clearly recognized in 1939 and confirmatory evidence was supplied by the vast experience with malaria in the armed services in the Pacific during World War II. A controversy as to whether malaria might be the cause of false positive tests was definitely settled by those studies. Rosenberg[6] showed that mixed infections with *P. falciparum* and *P. vivax* gave the highest incidence of positive tests, and that the most consistent, clearcut serologic reactions occurred in from seven to ten days after the first paroxysms. He found that positive tests might persist from four to six weeks after the onset. The frequency of such false positive tests reported in several series varied from 20 to 30 per cent of active cases. The point to be emphasized is that the false positive reactions are encountered only in *active* malaria, and are lost when the infection loses its clinical manifestations. In other words, a false positive test as the result of malaria is *not* a lasting abnormality. Therefore, the presence of positive reactions in a person giving a history of malaria in the past does not invalidate their importance as probable evidence that syphilis is present.

Diseases of viral origin. It is in this group of diseases that the false positive tests for syphilis are probably encountered most frequently and which present the most pressing problem to the physician, since they are so universal. Attention was first

attracted to this group by studies in 1937 or 1938 in which false positive results were encountered in groups of young persons. (Actually it was these findings which led to the study of false positive tests for syphilis and the growth of our knowledge on the subject in the last fifteen years.) In certain student health services of large universities in the North it was found that positive tests temporarily appeared in some young persons. At about the same time Rothbart[7] reported 12 instances of children who had for a time false positive tests and in whom the parents were negative. It is very probable that these false positive tests which were first recognized in young people were related to intercurrent viral diseases.

Case No. 3.—A 33 year old physician sustained a puncture wound of the finger in March 1946, while operating on an untreated syphilitic who had had a recent rash. On August 10, 1946, he developed pharyngitis and malaise lasting four days. As a donor for blood, a positive Kahn was found on September 6, 1946. On October 25, 1946, he noted cervical lymphadenopathy. PBO 300,000 units were given on November 3 and 5. Heterophile tests were negative as were blood smears. During November he had herpetic stomatitis; in December erythema nodosum. Serologic tests were as follows:

	Wassermann	Kahn	Kahn (State Lab.)
Oct. 30, 1946	Pos.	Pos.	
Nov. 21	Pos.	40 Units	80 Units
Nov. 27	Pos.	120 U.	40 U.
Dec. 4	Pos.	160	40
Dec. 16	Pos.	80	20
Dec. 27	Pos.	80	20
Jan. 14, 1947	Pos.	20	4
Jan. 30	Pos.	4	4
Feb. 11	Neg.	Neg.	3
Feb. 27	Pos.	4	4
Mar. 18	Pos.	4	10
June	Neg.	Neg.	
Aug.	Neg.	Neg.	

The blood has been consistently negative since the summer of 1947.

Comment. Did this physician contract syphilis d'emblée in March, 1946? If so he escaped secondary manifestations, for the pharyngitis in August and cervical lymphadenopathy of October appeared too late to represent secondary syphilis. Furthermore, 600,000 units of penicillin in beeswax and oil would not reverse the blood in well established early syphilis. It seems instead that this physician was suffering almost constantly all fall with viral disease of one type or another.

Case No. 4.—A 22 year old white woman was admitted in childhood to the Pediatric Ward of Vanderbilt University Hospital in 1938. At this time the Kahn test was negative. She married in July 1949; premarital tests on both spouses were negative. She was divorced a year later. There were no premarital exposures. Coitus occurred once with her ex-husband in July 1951. On November 26, 1951, appendectomy was done at Vanderbilt University Hospital and 600,000 units of penicillin were given postoperatively from November 26 to 28. Because the Kahn test was positive she was followed in the syphilis clinic where serologic tests were reported as listed below.

On Dec. 14, 1951, spinal fluid examination was negative.

Case No. 4	Wassermann	Kahn	VDRL	Unknown test
Nov. 26, 1951		Pos.	Neg.	
Dec. 10				Pos. (Georgia State Lab.)
14	Neg.	Dbt.	Pos.	
22	Neg.	Dbt.	Neg.	
29	Neg.	Dbt.	Neg.	
Jan. 4, 1952	Neg.	Dbt.	Neg.	
26	Neg.	Dbt.	Neg.	
Mar. 22	Neg.	Neg.	Neg.	

Comment. This represents temporary false positive tests. If she had acquired syphilis from her ex-husband in July 1951 she would have had well established syphilis by November which would not have responded to 600,000 units of penicillin in so short a time. Futhermore, the Wassermann test was never positive. The appendix showed little acute inflammation. Did she have some type of viral infection manifested by fever and abdominal symptoms?

Of the group of viral diseases the one most notoriously accompanied by false positive tests has been *infectious mononucleosis.*

Case No. 5.—A 22 year old white Vanderbilt medical student was admitted to the hospital in January 1939, because of severe infectious mononucleosis. His serologic course was as follows:

	WASSERMANN	KAHN
1937 (Clinic)	Neg.	Neg.
1938 Hospital	Neg.	Neg.
1939 Hospital		
Jan. 18	Neg.	Dbt.
24	Pos.	Pos.
25	Pos.	Pos.
29	Pos.	Pos.
Feb. 6	Neg.	Dbt.
Mar. 7	Neg.	Neg.
Apr. 15	Neg.	Neg.

Comment. Consistently positive complement fixation and flocculation tests due to infectious mononucleosis.

This is very important since the clinical manifestations of the disease may superficially suggest secondary syphilis. With sometimes mild to moderate constitutional symptoms of fever, arthralgias, generalized aching and the like, a generalized lymphadenopathy, at times a macular rash, sore throat, a palpable liver and spleen and positive blood tests,—what more could be desired for a diagnosis of secondary syphilis in a young man? Bernstein[8] first called attention to the matter in 1938. Since then infectious mononucleosis has been well studied from the standpoint of false positive tests, and many papers have appeared on the subject. In various series it has been found to be associated with false positive tests in from 10 to 60 per cent of cases. Since in false positive tests there is great variability from day to day, this great discrepancy in the incidence may readily be understood. If serologic tests are done frequently during the course of infectious mononucleosis, a higher incidence of false positive tests will be found than if the test is only done once or twice in a given case. Incidentally the false positive reaction bears no relationship to the heterophile agglutination reaction, at times appearing before the agglutination test becomes positive and at times being absent while it is still strongly positive.

Another viral disease of importance is *vaccinia*. The occurrence of false positive tests in those having vaccinia first became known in 1940.[9] Subsequent studies, particularly in the Army during World War II, have indicated the importance of this disease as the cause of false positive tests. In some 10 to 15 per cent of those having "takes" following vaccination for smallpox there will develop positive or doubtful reactions with the flocculation tests for syphilis. In those in whom vaccinoid reactions occur the incidence of positive tests is less. Occasionally false positive reactions may be encountered in closely related viral diseases such as the herpetic ones.

Viral pneumonia. In the past fifteen years, since the recognition of first so-called "atypical pneumonia", now recognized as pneumonia of viral origin, there has come the knowledge that this type of viral infection may be accompanied by false positive tests for syphilis. (This was recognized in 1932 in Sweden.) Clifton and Heinz[10] called attention to false positive tests during upper respiratory infections in infants. Many papers on false seropositivity have appeared subsequently. The incidence of false positive tests in this disease is found to be about 20 per cent.

Case No. 6.—A 21 year old white student nurse developed viral pneumonia. Her blood tests at Vanderbilt University Hospital were:

	WASSERMANN	KAHN
Nov. 14	Pos.	Pos.
19	Pos.	200 units
22	4+ in 0.005cc	240+ units
Dec. 1		120 units
17	Neg.	2 units
28	Neg.	Neg.

Comment. False positive tests for syphilis due to viral pneumonia. No antibiotics or other drugs were used. The high titers are most unusual.

Case No. 7.—Mrs. D, a 34 year old white woman had been followed on the Vanderbilt University Hospital wards and in the clinics from 1937 to 1950, mainly for pregnancies and delivery. Wassermann and Kahn tests were negative in 1937, 1942, 1944, 1945, 1947, 1948, 1949. She was admitted to the medical ward, January 17, 1950, because of chest pain, cough, bloody sputum; temperature 100.4°; white blood cells 8000; x-ray diagnosis—"bronchopneumonia, left base." From January 17 to 21, she received 2,900,000 units of penicillin. Because of positive blood tests she was referred to the syphilis clinic. The following is the serologic course. No further treatment was given.

	Wassermann	Kahn (VUH)	Kahn (State)	VDRL
Jan. 17, 1950	Pos.	Pos.		
20	Pos.	120 units	20 units	
Feb. 3	Pos.	120 U.	2 U.	
11	Pos.	4 U.	Dbt.	
Mar. 6	Pos.	Dbt.	Neg.	
Apr. 1	Pos.	Dbt.	Neg.	
May 20	Dbt.	Neg.	Neg.	
Aug. 12	Neg.	Neg.		
Nov. 4	Neg.	Neg.		
Dec. 9	Pos.	Neg.		Neg.
Mar. 10, 1951	Neg.	Neg.		Neg.
May 5	Neg.	Neg.		Neg.
Oct. 20	Neg.	Neg.		Neg.
Mar. 8, 1952	Neg.	Neg.		Neg.

The husband, a patient in the Vanderbilt University Hospital Diabetic Clinic for years had negative Wassermann and Kahn tests in 1943. He was brought in for tests because of his wife's findings on February 17, 1950, and was found to be negative, as well as in July 1950, and June 1951.

Comment. Did this woman have syphilis with seronegativity as the result of penicillin given for pneumonia? If so, it would represent a very rapid response. It is probable that this stable mother of several children, who denied extramarital exposures, and whose husband denied the same and was seronegative, had false positive tests due to viral pneumonia.

Mumps and Measles. There is accumulating knowledge that false positive tests may occur in these diseases. Chicken pox has been accompanied by positive tests for syphilis.

Case No. 8.—An 18 year old negress was admitted to the Vanderbilt University Hospital ward on May 26, 1941, because of oophoritis and leptomeningitis due to mumps. Serologic course was as follows:

	Wassermann	Kahn
1928 (Clinic)	Neg.	Neg.
1935 (Hospital)	Neg.	Neg.
1941 (Hospital)		
May 26	Dbt.	Pos.
27	Dbt.	Pos.
27 (Spinal fluid)	Neg.; Cells 216; Glob. Pos.	
29 (Spinal fluid)	Neg.; Cells 52; Glob. Pos.	
June 6	Neg.	Pos.
17	Neg.	Pos.
20	Neg.	Dbt.
24	Neg.	Pos.
July 14	Neg.	Neg.
Aug. 18	Neg.	Neg.

Comment. False positive tests due to viral infection (mumps).

Lymphopathia Venereum. Here is a viral disease which is of particular interest to physicians in the South because it is limited almost entirely to the colored race. Furthermore, it is important to recognize that falsely positive tests may occur in a disease usually beginning as a genital infection. The genital lesion, inguinal adenopathy, before it breaks down, and a positive serologic reaction certainly sets the stage for the diagnosis of syphilis. I recall now that fifteen years ago, before the extent of our present knowledge of false positive tests, I treated a couple of patients with positive tests in the presence of lymphopathia venereum with the idea that they probably had latent syphilis also; subsequently these patients developed darkfield positive syphilis.

Leprosy. This is the only bacterial disease not uncommonly attended by false positive tests. It has been shown that in as high as from 30 to 60 per cent of cases the blood tests may be positive. And curiously enough it is the complement fixation test which is more likely to be falsely positive than the flocculation test.

Miscellaneous Conditions. A number of other conditions coming to the attention of the physician may be associated with false positive tests. During World War II, it was found that "booster" doses of tetanus toxoid may be followed by false positive flocculation tests for syphillis.[11] This does not occur with the original immunization with the toxoid. False positive tests have also been reported occasionally in patients who have received horse serum antitoxins and also immunization of one type or another.

Month	Laboratory	Wassermann	Kahn	Kline	Unknown Test
March	State	Dbt.	Neg.	Pos.	
April	State	Neg.	Neg.		
June	Private				Pos.
June	Private				Pos.
August	State	Dbt.	Neg.	Pos.	
	Spinal fluid negative.				
October	Vanderbilt	Neg.	Neg.		
October	Vanderbilt	Neg.	Neg.		
October	State		Neg.		
December	State		Neg.		
December	Vanderbilt	Neg.	Neg.		

Case No. 9.—A 28 year old physician, health officer, was immunized for yellow fever. He had had negative tests for five years. A list of his blood tests is given above.

Comment. False positive tests due to immunization against yellow fever.

The diseases characterized by *hyperglobulinemia* have been shown at times to be accompanied by false positive tests, particularly of the flocculation variety. In disseminated lupus a variable per cent of patients have false positive tests. Occasionally Boeck's sarcoid, multiple myeloma, and portal cirrhosis also have been shown to have positive tests.

Case No. 10.—Mrs. A. B. was a 49 year old white woman who gave a three-year history of recurrent skin lesions of the face, neck and arms, of recurrent swelling of joints, general malaise and weight loss, and of febrile periods. There was no history of acute syphilis. Three pregnancies terminated in the birth of well infants. Her husband, age 40, was seronegative. A son, age 14 was seronegative. Biopsy of skin:—lupus erythematosis.

	Wassermann	Kahn	
Aug. 27, 1941	Pos.	Pos.	(Serum albumin 2.82 gm. %)
Aug. 29	A.C.	Pos.	(Serum globulin 4.20 gm. %)
Nov. 21	A.C.	Pos.	
Jan. 23, 1942	Pos.	Pos.	

On September 1, 1941 the spinal fluid was negative. There was no change in the clinical course under bismuth therapy.

Comment. False positive tests due to lupus and possibly the hyperglobulinemia. The anticomplementary Wassermann tests should be noted.

Case No. 11.—A 50 year old negress was observed because of Laennec's cirrhosis with hyperglobulinemia. The history was negative for syphilis. A number of children were seronegative. The serologic findings were the following:

	Wassermann	Kahn	Serum Globulin
April 12	Anticomp.	Pos.	4.12 GM.%
17	Anticomp.	Pos.	4.42
May 7	Anticomp	Pos.	4.4.
15	(State)	Pos.	
July 20	Anticomp.	Pos.	
26	Anticomp.	Pos.	
Nov. 7	Pos.	Pos.	
22	Pos.	Pos.	

In October the spinal fluid was negative.

Comment. The persistently anticomplementary Wassermann reactions accompanied by positive flocculation tests in the presence of hyperglobulinemia point to false positive tests for syphilis.

At the conclusion of the last World War it was divulged that in some clinics, blood donors after repeated donations developed temporary seropositivity. This finding was denied in other clinics where similar studies were made.

CHARACTERISTICS OF FALSE POSITIVE REACTIONS FOR SYPHILIS

From the foregoing discussion it is quite obvious that a physician will find among his patients at times individuals who have false positive tests. It may be said by a physician that he has never encountered these circumstances. But he must recall

how infrequently he has done blood tests for syphilis at a time when a positive test might be anticipated. All of us have treated malaria, infectious mononucleosis, viral pneumonia, and the like without having these tests done. It is only by studies as carried out in the Army, in teaching and in other large hospitals, that the incidence of false positive tests in diseases other than syphilis has been brought to light. The significant thing, however, for the practitioner is to recognize *that these circumstances do exist.* In those instances in which a blood test is done on one of his patients during the course of some disease and is returned positive, he must ask himself, "Does this represent syphilis, or is it due to the disease for which I am treating him at the moment?" Since every physician will encounter such circumstances at some time (these will occur much more frequently with the increasing trend to hospital practice) he must be aware of the characteristics of the false positive tests. The following generalization may be stated:

1. The inherently biologic false positive test (of Kahn's high titer universal reaction type) is a normal pattern which will be with the patient all his life.

2. Positive reactions due to the diseases mentioned usually appear from seven to twenty-one days after the onset of the disease. This suggests that a positive reaction of blood taken on the first or second day of the disease probably is not related to the disease in question.

3. In general there is a great tendency to fluctuation in the degree of positivity in the false positive case. Instead of being consistently positive or of a consistent titer, the pattern is more likely to be, on successive blood tests made at one or two-day intervals, a doubtful, a positive, a negative, a positive, a doubtful and so on. If quantitative tests are done, great fluctuations in titer appear from day to day. This explains, as was commented upon earlier, why the incidence of false positive tests varies so greatly as among different series of cases. For example, if a physician limits himself to a Kahn or other test, in infectious mononucleosis on the first day he sees the patient, he will not find the 40 to 50 per cent incidence of false positive tests which others have found upon doing tests daily or every other day.

4. In practically all instances the false positive test will not persist for more than ninety, or at most one hundred and twenty days. This fact emphasizes the point that if there is a strong suspicion that a positive test during the course of an acute disease may be falsely positive, antisyphilitic treatment should not be begun. Instead the patient's course should be followed to the point of spontaneous seronegativity.

5. In general, the false positive tests are of lower titer than would be expected in syphilis. This statement cannot be made without qualifications. Thus Case No. 6 is an instance to the contrary. (On the other hand, late latent syphilis, as we have shown, is characterized by a test of low titer, especially in the person who has had syphilis of many years' duration.)

6. As has been indicated, the false positive tests are more likely to be encountered with the more sensitive tests, the flocculation tests, and less commonly with the more specific complement fixation tests. Therefore, the more common finding is a positive Kahn, VDRL or Kline test and a negative or an anticomplementary (no antigen in the tube) Wassermann test. Another point of importance is that if a battery of flocculation tests is utilized for testing in these cases, one will find a less consistent pattern of positivity than in syphilis,—that is, there may be negative, doubtful or positive results scattered among the tests rather than consistent positivity in each of the tests.

To date there is no serologic test which is a dependable test in terms of unquestioned specificity or sensitivity. The VDRL test is supposed to be more sensitive and more specific but cannot be expected to be free of false positive reactions as was shown in the 1949 National Serologic Evaluation Survey.[12] Careful studies have been going on for a decade by Neurath on serum fractionation in the hope of separating the syphilitic from the false positive sera. Act-

ually to date the only method of proving that a positive test is due to syphilis is the use of a laboratory technic so limited in its use that it can only be used in experimental work at the present time. This is the immobilization test of Nelson, whereby the actual *T. pallidum* is immobilized by the serum of a person infected with syphilis. Since the organism cannot be grown, it involves the use of many infected animals in order to have sufficient treponemata available for such a test.

THE DIAGNOSIS OF SYPHILIS BASED ON SEROLOGIC TESTS

Thus it appears that the interpretation of doubtful or positive tests for syphilis, in persons having no history or clinical evidence of syphilis, presents a most troublesome problem to the doctor.

Moore[13] points out that on clinical grounds a physician is certainly justified in suspecting a false positive reaction if it appears in one of at least two groups of patients. The first consists of young girls or women with no history of syphilitic infection, and who show no evidence of acquired or congenital disease, and who have not been demonstrably sexually exposed, as in the case of virgins, for example. The second group are those of any sex or age who give no history or physical evidence of syphilis, and who have positive tests for the first time after having had previously negative tests, and who have had no exposure in the interim.

In addition one can certainly say that a physician is justified in suspecting a test to be falsely positive in a patient who lacks historical or clinical evidence of infection or treatment, and who has doubtful or weakly positive tests with conflicting results with different techniques or in different laboratories. This is more applicable to *younger* individuals, in their teens, twenties, or thirties. It is admitted, as indicated previously, that persons with syphilitic infection of duration for decades may have this type of serologic response, but they fall in an *older* age group.

Since it is obvious that the physician must be ready to question positive tests for syphilis, he must approach the problem with a definite plan. This should include the following items depending upon circumstances.[13]

1. A careful history is of course important in terms of intercurrent or recent infections, vaccination for smallpox, "booster" doses of tetanus toxoid and other types of therapy of a biologic nature, such as sera.

2. A careful physical examination which might give information of acute infection, particularly with reference to lymph nodes, spleen, and lungs.

3. If there is any reason to suspect the possibility of malaria, for geographic reasons, a thorough search of blood smears for malaria is essential.

4. Study of blood smears for evidence of infectious mononucleosis and the test for the heterophile antibodies is essential. (This is especially true in younger persons.)

5. The repetition of serologic tests for syphilis using several different techniques, that is, a battery of tests, including both complement fixation and flocculation tests, should be helpful. This is particularly true if quantitative tests are also carried out.

6. The tests should be repeated numbers of times. It is worthwhile to use different laboratories if one has some question about technical abilities available in a given laboratory.

7. If congenital syphilis is a possibility, as in some young persons, the examination of other members of the family may be most helpful. Of course if there has been sexual exposure, the sex contacts should be investigated, if possible.

8. Examination of the cerebrospinal fluid can be most helpful, since the incidence of false positive tests in the spinal fluid is negligible. *A positive spinal fluid reaction therefore is strong evidence for syphilis.*

9. Certainly it is apparent that *antisyphilitic treatment must be withheld until a diagnosis of syphilis is established.* I wish to emphasize again the importance of this statement, even though many physicians consider penicillin an innocuous method of treatment that will do no harm. I again

wish to emphasize that the psychic trauma of making a diagnosis of syphilis is something which must be avoided. If antisyphilitic treatment is carried out, and subsequently the blood becomes spontaneously negative, having been falsely positive, the patient will always carry with him for the remainder of his life the mental scar that he has had syphilis and was treated for it.

One may approach the problem from a *positive* viewpoint somewhat as follows,—given a patient who has had the opportunity of acquiring syphilis but presenting a negative history for it or previous antisyphilitic treatment, and presenting on physical examination no evidence for syphilis, and in whom a negative spinal fluid is found. It also is assumed in this case that examination of family or sex contacts was either negative or they were unavailable for examination. Furthermore, it is assumed that the history and examination reveal none of the diseases or conditions which might give rise to a false positive test. It is also assumed that no negative tests have been reported by a reputable laboratory in recent years.

1. The presence of persistent and repeatedly positive reactions in both the complement fixation and flocculation tests then are accepted as making the diagnosis of syphilis and treatment then is given. (By *persistently* and *repeatedly* I mean the taking of blood tests for weeks or months as may be indicated in the given case. In this type of case one obviously is not dealing with acute or infectious syphilis, and if one is dealing therefore with latent syphilis no emergency is present which requires the immediate establishment of the diagnosis and antisyphilitic treatment.)

2. If the flocculation tests are persistently and repeatedly positive and complement fixation tests are doubtful, they are considered to represent syphilis if the patient has admitted to repeated sexual exposure.

3. Persistently and repeatedly positive flocculation tests with negative complement fixation tests are accepted by us as indicating the presence of syphilis in persons who have been sexually promiscuous for many years. This implies that with the passage of years the complement fixation test may have become negative, the flocculation test remaining positive. This suggests that one is dealing with persons who, having been promiscuous, might have been infected twenty or thirty years before. (These circumstances would not obtain in persons of such an age group that they would have been infected within the previous ten to twenty years. In such instances the complement fixation test would also be positive.)

4. In the presence of fluctuating flocculation tests and with negative, or possibly an occasional doubtful complement fixation test, the test can not be accepted as indicating syphilis.

It is apparent that no set of rules can be established which will cover all circumstances. These rules for evaluating the serologic tests for syphilis are suggestions *only*, and each practitioner must in the end use his own clinical judgment in the individual case in arriving at a decision. This is as true of the interpretation of the test for syphilis as of the "nonfilling gall bladder," the electrocardiogram with minor ST-segment or T-wave changes, and the like. In all these the ancillary methods of diagnosis must be correlated with the patient's history and physical examination. Clinical judgments can only be based upon a full knowledge of the biology of the syphilitic infection and the serologic changes related to it.

CONCLUSIONS

Though the serologic tests for syphilis are of inestimable value in mass surveys, positive reactions, in a goodly percentage, may not be indicative of syphilis. The past decade has shown an increasing and accumulating knowledge of the factors which may cause false positive tests. *Since the treatment of syphilis should mean the treatment of a disease and not the treatment of a blood test*, careful study is required in the evaluation of any positive test in the absence of overt manifestations of syphilis. *Treatment must be withheld until the diag-*

nosis is established. The psychoneuroses and anxiety states resulting from a diagnosis of syphilis are second to none in severity and far-reaching effects.

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MEDULLARY FIXATION OF FRACTURES OF THE LONG BONES*

RUFUS H. ALLDREDGE, M. D.
DANIEL C. RIORDAN, M. D.
and
CRAMPTON HARRIS, M. D.
NEW ORLEANS

Medullary fixation of the long bones was first attempted many years ago, only to be discarded for other methods, for reasons which are not entirely clear at this time. During the past ten years the method has been improved and standardized, until at present it is regarded as a sound and comparatively safe procedure, commonly employed by orthopedic surgeons in many parts of the world.

Medullary fixation by pin or nail combines four principles of fracture treatment which, particularly in fractures of the femur, cannot be accomplished as well by any other means:

1. Simplicity, adaptability, and safety to the patient during application of the technique.

2. Accurate reduction of the fracture.

3. Good, reliable, anatomical reduction of the fragments, with dependable maintenance of position, without distraction, and with provision for impaction of the ends of the fragments through exercise and weight bearing.

4. Early postoperative use of the muscles and joints, and early weight-bearing.

In fractures of the femur, medullary fixation has notable advantages. As external fixation, traction, splints, plaster casts, or bed traction are not required postoperatively in most cases treated by this method, frequently, the patient may begin actively moving the part on the second or third postoperative day. When medullary fixation of the femur is accomplished soon after the occurrence of the fracture, exercise of the limb with full range of motion in all joints of the extremity may be undertaken in bed on the first or second postoperative day. In other cases, bed exercises may be started between the third and seventh days, depending on the needs and limitations of the individual patient. It is desirable for many to begin ambulation with crutches on the fifth or sixth day, and light weight-bearing with crutches after the seventh or eighth day. Thus, the usual muscle wasting and atrophy are avoided, and the possibility of joint fibrosis, or stiffness, is eliminated. The function of the limb is fully maintained while healing takes place, and the early weight-bearing with support (such as crutches) causes impaction of the ends of the bones, which actually hastens healing.

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The enormous benefits and advantages to the patient are self-evident.

Medullary fixation is less strongly indicated in fractures of the other long bones, but may be quite usefully employed under certain circumstances described later herein.

Successful application of the technique in all cases is dependent upon care in the selection of the patient, accuracy in the preparation of materials, proper surgical procedures for insertion of the nail, and appropriate postoperative management. Conservatively and carefully handled, this method is as safe, or safer, than other methods for the treatment of fractures in normal, or abnormal bones.

The purpose of this presentation is to summarize our experiences in treating fractures by means of this procedure since we first employed medullary fixation early in 1947, in a case of nonunion of a fracture of the femur.

Fig. 1A—Fracture of the femur through upper third of shaft in above-knee amputee.

Fig. 1B—Same case postoperatively. Fixation of fracture of the femur in above-knee amputee, with Kuntscher nail.

MEDULLARY FIXATION FOR FRACTURES OF THE FEMUR

The advantages of medullary fixation in treating fractures of the femur have been most clearly demonstrated in those patients with whom other methods have failed. The technique has been extremely beneficial in cases of malunion, delayed union, and nonunion of the femur, with or without loss of portions of the shaft. It has been equally useful in patients for whom bone plates and screws, or bone grafts, had been unsuccessfully employed.

Medullary fixation has been successfully utilized in many cases of pathological fractures of the shaft of the femur caused by primary bone disease, such as osteogenesis imperfecta, bone cysts, fibrous dysplasia, or Paget's disease.

The method has been used with equal success in metastatic carcinoma and other generalized diseases. Fractures through metastatic carcinomatous lesions have undergone bony union following medullary fixation and supplementary radiation.

Medullary fixation has been used to great advantage in fractures of the femur in below-knee, or above-knee, amputees (Figs. 1A and 1B, and 5A and 5B.) This obviates the necessity of plaster cast immobilization and allows free joint motion and early use of the prosthesis.

The advantages of the technique in fixa-

Fig. 2A—Femoral shortening operation on 16 year old male, showing fixation with Kuntscher nail, and chip grafts obtained from 1 5/8 inch of bone removed. (For equalization of leg length)

tion for femoral shortening, in rotation and angulation osteotomies, and in arthrodesis of the knee are well known.

Medullary fixation for fracture of the femur in association with fracture of the patella on the same side, and in the presence of other serious fracture dislocations, results in such great benefit to the patient that this method is incomparably useful and advantageous to all concerned. In association with paraplegia, or extensive burns, medullary fixation of the femur is equally beneficial.

This procedure, of course, cannot be used routinely in all fractures of the femur. Medullary fixation is contraindicated in young children; however, it may have a place in the treatment of adolescents, particularly for femoral shortening (Figs. 2A, 2B) and shaft osteotomies. Recently, it has been employed for pathological conditions of the bones in older children, such as in osteogenesis imperfecta in which multiple osteotomies have to be done to straighten the bones.

Indications for use of the method in the treatment of compound fractures are limited. Generally, when medullary fixation is to be used for compound fractures, it should be delayed until the wound has had time to heal. The technique is not recommended generally for open fractures, and when undertaken in these cases must be used with the same great care that is exercised in the use of any other type of internal fixation of compound fractures. The difficulties encountered are well known and need not be explained here.

Medullary pinning of femoral shaft fractures is generally limited to the two central

Fig. 2B—Same case showing status of healing five months after insertion. Ready for extraction of pin.

Fig. 3A—Fracture of the femur in a young adult female.

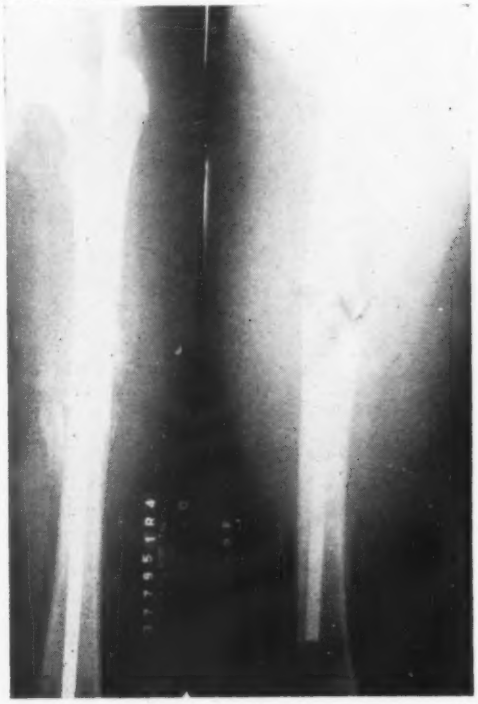

Fig. 3B—Same case, showing fixation with Kuntscher nail, two months postoperatively. Note callus.

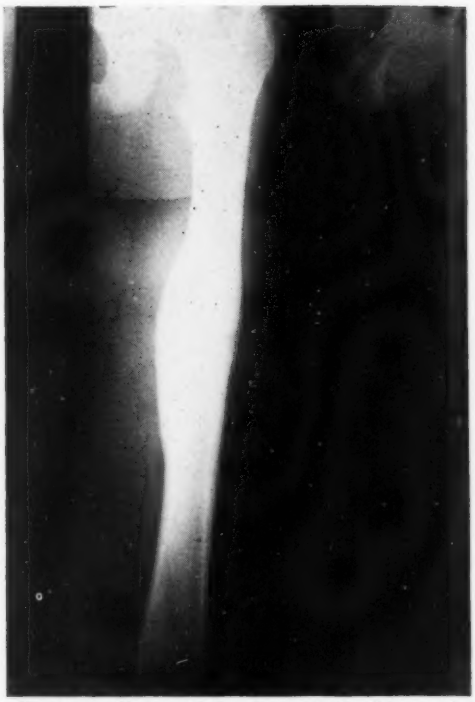

Fig. 3C—Union of fracture of the femur when Kuntscher nail was removed ten months after insertion.

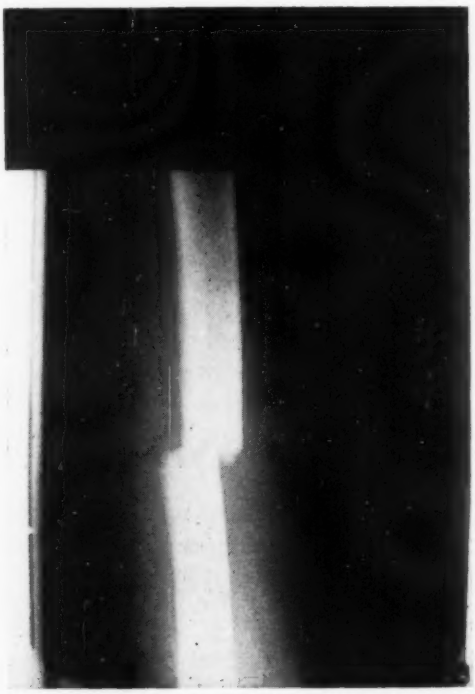

Fig. 4A—Fracture of the femur in a 56 year old male.

Fig. 4B—Same case, showing fixation with Kuntscher nail, and status of healing four months after fracture. (Iliac bone chips had been placed around the fracture site.)

Fig. 4C—Union of fracture of the femur when Kuntscher nail was removed ten months after insertion.

quarters of the shaft (Fig. 3A, 3B, 3C; Fig. 4A, 4B, 4C). If the pin is used in fractures too near the trochanter, or too near the condyles of the femur, fixation may not be mechanically sound enough to justify the selection of this method.

Formerly it was thought that use of the medullary pin, or nail, should be limited to relatively transverse fractures in the middle third of the shaft of the femur. However, we have found that it may be employed to advantage in oblique fractures and even in comminuted fractures. Additional internal fixation, accomplished with metal plates, screws, or wire loops around the fragments, is used to reinforce the pin in the medullary shaft. (Fig. 5A and 5B). The medullary nail may be employed for the fixation of fractures at two or more different levels of the femur. The routine use of iliac cancellous bone chip grafts about the fracture site was instituted sev-

Fig. 5A—Spiral fracture of the femur with butterfly fragment.

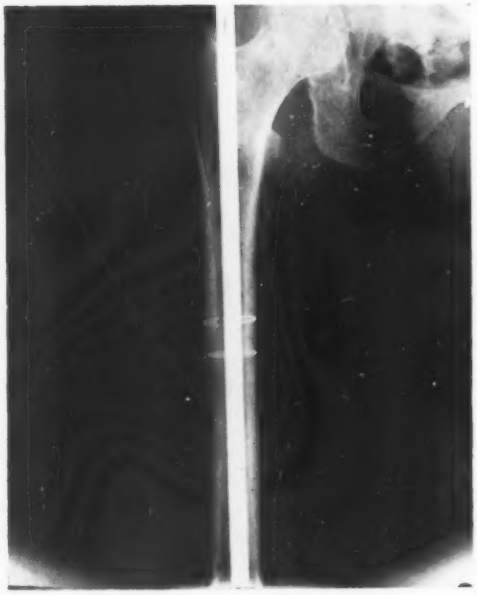

Fig. 5B—Same case, after fixation of fracture of the femur with Kuntscher nail and wire loops to hold loose fragment in place. (Patient has amputation below the knee.)

eral years ago and seems to hasten bone union.

TECHNIQUE

Materials: Various types of nails, pins, and accessory equipment are available. The open-sided, partial metal tube of the so-called clover leaf shape on cross section, with an eye near the proximal end for extraction, was used by Kuntscher and is still the nail most commonly used in this country and abroad. While the Kuntscher nail serves most of our general needs, we have occasionally used others. The diamond-shaped solid metal pin of Hansen and Street has been successfully applied in many cases. We used it considerably in the early days of medullary fixation. This pin does not require a wire guide for placement in the medullary canal. Other types include solid round rods, solid round tubes, and the three-flange nail, or pin, similar to the Smith-Petersen nail for the hip. It probably makes little difference which type of nail, or pin, is used—the more important factor being the method of application.

Measurement of the Nail, or Pin: The determination of the length and diameter of the medullary nail required in each case is of paramount importance. The more accurately this can be done, the better will be the result. The safest and simplest way to determine the length is first to take the measurement of the normal femur from the trochanter to the knee joint. From this measurement, the exact length of the nail needed for the individual patient can be calculated, allowing only the eye of the nail to protrude above the greater trochanter of the femur, for later extraction. The nail should not extend beyond one inch proximal to the knee joint, in most cases.

To determine the diameter of the nail, one should test the estimated diameter at the time of operation by inserting the nail into the open end of the bone fragment that contains the narrowest portion of the medullary canal. The nail should then be test-driven into one fragment; or, if there is any question, into both fragments and then extracted before it is finally inserted in the usual manner, depending upon the type of nail used and the technique employed. This method of determining the diameter avoids the possibility of insertion of a nail so large that it becomes inextricably jammed in the medullary canal; or of one so small that fixation of the fragments will be inadequate.

Other methods for determining the length and diameter of the nail are sometimes employed, for example, the procedure of strapping a notched, graduated metal rod to the center of the thigh and taking anteroposterior x-ray views of the rod and the femur on the same x-ray plate. We have not found this, or any other method, to be as accurate or as simple as the technique described above.

Insertion and Fixation: All fractures of the femur are surgically opened and exposed through the anterolateral, the lateral, or the posterolateral approach, depending on the site of the fracture. In the distal portion of the femur, the anterolateral approach, or the lateral approach through the vastus muscles, serves satisfactorily in our experience. In the middle and upper portions of the femur, a lateral approach di-

rectly through the vastus lateralis muscle, or a posterolateral approach posterior to the vastus lateralis muscle, is eminently satisfactory.

After the fracture has been exposed, if the Kuntscher clover-leaf type of nail is to be used, the nail previously estimated to be of proper length and diameter is fitted into the medullary canal of the fragment containing the narrowest portion of the canal —or into both fragments, if the fracture is through the narrowest portion of the canal. The nail is then driven well past the narrowest point of the medullary canal, and if the nail is determined to be too small, sizes 1 mm. larger in diameter are tried until a snug fit is obtained. The metal pin guide is then driven up the medullary canal of the proximal fragment and out through the trochanter, and through an incision above the trochanter. It may, or may not, be necessary to use a reamer over the protruding sharp end of the pin to start the medullary nail on the pin guide. If the end of the pin is sharpened, it can be driven over the nail without reaming out of the point of entrance of the nail. If it is not sharpened, particularly where nails are used which are sawed off to length at the time of operation, reaming over the guide pin may be helpful in starting the nail. The nail of proper length and diameter is then passed over the guide pin and driven into the medullary canal of the proximal portion of the femur. Gradually, as the nail is driven down, the pin guide is extracted to avoid the possibility of the open portion of the nail closing down on the pin guide, necessitating a difficult extraction procedure. After the pin is well started, or when the end of it appears at the open end of the proximal fragment at the fracture site, the guide pin is completely extracted; and then with the fracture held accurately reduced, the medullary nail is driven on into the distal shaft to the desired length.

In some cases, it may be advisable to withdraw the guide pin completely and reinsert it through the nail from the proximal end until the nail is driven for a distance of three to six inches past the fracture site. In fractures of the middle of the shaft of the femur, it is advisable to hyperextend slightly the fracture site, so that the nail will not protrude through the anterior cortex of the femur at the distal end near the knee joint. X-ray control of the level of the pin at the distal end of the femur should be routinely carried out at operation.

Oblique fractures should be circled with wire loop sutures, or in some cases, transfixed with additional screws to prevent rotation. Generally, wire sutures, or loops, are preferable. Comminuted portions of the bone may be fixed in any feasible manner by these methods. Bone plates and screws may be used in any except the more comminuted fractures.

When the Hansen-Street nail is used, no guide pin is necessary. Thus, the technique of inserting the pin is considerably simplified. The pin itself is driven through the medullary canal of the proximal fragment until the upper end of the pin is driven through the end of the proximal fragment. Following this, the fracture is reduced and held while the protruding metal nail is driven down into the distal fragment.

The entire operation of medullary fixation can be carried out by the skilled surgeon with less difficulty and in less time than required to fix the bone with the usual plate and screws. This, of course, is based on the assumption that the surgeon is sufficiently experienced in the technique to avoid some of the well known pitfalls. The hazard to be particularly avoided is the possibility of getting the pin so tightly wedged in the medullary canal that it cannot be extracted. Using the technique advocated here, we have not encountered any such difficulties.

MEDULLARY FIXATION FOR PATHOLOGICAL CONDITIONS OF THE FEMUR

We have used the medullary nail to advantage in various pathological conditions of the femur. In one case (Fig. 6) a young man with osteogenesis imperfecta had suffered about 32 fractures to the shafts of both femora. There was severe anterolateral bowing of the shafts. The patient had sustained a fracture through the middle

Fig. 6—Osteogenesis imperfecta with fractured shaft (upper fracture) and osteotomy done to thread segments over the nail. Excellent result.

Fig. 7A—Pathologic fracture of the femur in association with metastatic carcinoma of the breast.

Fig. 7B—Same case after fixation with Kuntscher nail. Union of fracture after x-ray treatment.

third of the shaft of one femur below the point of the main bend in the shaft. The fracture was opened in the usual manner, but the curve above the fracture in the proximal fragment was so great that it could not be transfixed with the nail until osteotomy was done at the point of the greatest curvature of the shaft. This was done and the nail was then passed throughout the distance of the shaft, through the loose middle portion of the shaft of the femur, which had resulted from osteotomy and fracture at two different levels. Fixation of the two fractures was adequate and the fracture of the distal third of the shaft incident to the nailing healed in satisfactory position and alignment. (The result was so good that the patient wanted the other side straightened and treated in a similar manner.)

We have had occasion to treat several pathological fractures of the shaft of the femur caused by metastatic carcinoma. In one case, the medullary fixation procedure was carried out on the day the fracture oc-

curred. Radiation therapy was given afterward and satisfactory solid bony healing resutled (Fig. 7A, 7B). Similar results have been obtained in other patients when radiation therapy was given before medullary fixation. In still another patient, a metastatic carcinomatous lesion in the femur was discovered before the fracture occurred. Radiation therapy had already been administered before medullary fixation was carried out. In this case the nail was inserted from the trochanteric region without opening the site of the carcinomatous lesion.

In our experience, the use of the medullary nail in very obese patients with fracture of the femur, especially in association with other injuries, has incomparable advantages. In paraplegics with fracture of the femur, the obvious advantages are so great that this method should be employed whenever at all possible.

MEDULLARY FIXATION OF THE FEMUR FOR NONUNION WITHOUT LOSS OF THE SHAFT

In cases of nonunion of the shaft of the femur, with or without loss of the shaft of the bone, we have obtained union with the use of the medullary nail in several cases in which other methods have failed. The use of multiple, small cancellous bone chips from the ilium packed into the defect around the nail, or about the site of nonunion, gives the earliest and best results. In some cases, it is apparently possible to obtain earlier union by this method in old fractures than in fresh fractures of the femur. Some of these cases have already been reported.[1]

POSTOPERATIVE CARE

The postoperative management depends, of course, upon the nature of the fracture, the effectiveness of the internal fixation used in the individual case, and upon the general condition and temperament of the patient. In the average case of fracture of the femur, after medullary fixation has been accomplished, the patient is sent back to bed with a pressure dressing on the leg, to remain in bed for a few days. No suspension traction or other fixation is used. After a few days active motions are started. Then the patient is encouraged to get up and support his weight with crutches, as soon as his condition indicates that it is possible and safe for him to do so. Weight-bearing on crutches is started as early as is safe in the individual case, and full active use of the part is then insisted upon.

CALLUS FORMATION AND HEALING TIME

While we do not believe that the use of the medullary nail hastens callus formation and healing time in the average case, apparently this does occur in some cases (Fig. 8A, 8B), while in others the process may be delayed. For this reason, in recent years we have, whenever possible, routinely placed cancellous bone chips from the ilium around the fracture site in femoral fractures. We have had no case of established nonunion following the use of the medullary nail; and thus far, no femoral fracture treated in this manner has failed to unite within the period of a year. Some have healed within three months, including fractures in which nonunion and even loss of a part of the shaft existed. As yet, we are

Fig. 8A—Fracture of the femur in a 19 year old male, seven months after operation. Solid bone union. (Anteroposterior and lateral views.)

Fig. 8B—Union of fracture of the femur when Kuntscher nail was removed eight months after insertion. Shows bony "cap" over the site of protruding end of the nail, which was asymptomatic.

unable to compare the time required for solid bony union after medullary fixation with the time required after other methods of treatment. Certainly, it is our feeling that in most cases union takes place sooner after medullary fixation than it would following other methods of treatment.

COMPLICATIONS AND ERRORS IN TECHNIQUE

Errors in technique and resulting complications are associated with incomplete adherence to the precision requirements of the method, and can be minimized or eliminated almost completely if medullary fixation is carried out under the circumstances outlined. These technical errors and complications are so well known that it is not our purpose to review them here.

In our experience, we have had no serious complications. We have had no infections, not a single case of fat embolism, nor a death from the use of this method. It is believed that the same happy experience can be achieved by anyone who will adhere carefully to the same general rules and principles that have been previously laid down by others, and by us in this presentation.

MEDULLARY FIXATION FOR FRACTURES OF THE TIBIA AND FIBULA

Although medullary fixation of the tibia for fractures of the tibia and fibula seems to have certain advantages in selected cases, the technique has not been used as widely in these cases as in fractures of the femur. We have used it in only a few patients having tibial fractures and our experience in this field is therefore limited. Recent reports on the use of the method in such cases have been encouraging, however, and more and more enthusiasm is becoming evident for medullary fixation of the tibia.

As in medullary fixation for fractures of the femur, there are various techniques that may be employed. Some of these have been published and some have not. Thomsen,[2] Lottes,[3] and Vom Saal[4] have each recently reported their experiences, and the results of their work will undoubtedly go a long way toward wider and more extensive use of the method for the tibia.

Special medullary pins of various types have been designed for the tibia. Insertion is made from the proximal end of the tibia, either by open reduction of the fracture site, or by closed reduction and blind nailing with x-ray control. The advantages seem to be chiefly more accurate reduction and earlier weight-bearing in plaster, with consequent earlier union in the cases reported. This method appears to be especially advantageous in segmental or multiple fractures of the shaft of the tibia and fibula.

After open or closed nailing, weight-bearing is started in a long-leg plaster cast, in most cases apparently earlier than it could be begun following most other methods of internal fixation.

Our own experience in this field is so limited that we are hesitant to give any impressions of the advantages or disadvantages of medullary fixation of the tibia.

MEDULLARY FIXATION OF THE HUMERUS

Medullary fixation of the humerus has been rather loosely employed, and frequently where it was not indicated. This has

been particularly true in cases in which the patients were children, but also in adults, for whom simpler nonoperative methods could well have been utilized. We feel that there is little need for medullary fixation in fresh fractures of the shaft of the humerus. Certainly there is no place for its use in children. Unfortunately, some advocates of the method have used medullary fixation where it was not indicated, to the eventual discredit of the method. This is especially true of the methods advocated by some who have developed special pins and techniques.

We have had one case of pathological fracture of the humerus due to metastatic carcinoma of the lung, which we believed was more advantageously fixed with a medullary pin than by any other procedure, inasmuch as union could not otherwise have been expected in the presence of this particular type of radiation resistant carcinoma (Fig. 9A, 9B).

Fig. 9A—Metastatic bronchogenic carcinoma of the humerus.

Fig. 9B—Metastatic bronchogenic carcinoma of the humerus after fixation with V nail.

MEDULLARY FIXATION FOR FRACTURES OF THE FOREARM BONES

Fractures of both bones of the forearm, and in some patients one forearm bone, have for a good many years been treated and fixed by medullary fixation. The radius is always entered from the distal end and the fracture site is usually opened. The pin, or pins, are driven well across the fracture site. Here again, there are various methods of fixation, some of which are more effective than others. Medullary fixation of the ulna has been carried out from either end, usually with open exposure of the fracture site for transfixion of the fracture (Fig. 10A, 10B; Fig. 11A, 11B).

We have not had sufficient experience with medullary fixation of the bones of the forearm to be in a position to give a final opinion as to the indications for this method, and the type of fixation to be used. The technique is being used more and more, but it will be several years apparently before anyone can be sure of the various aspects of medullary fixation to be considered in treating fractures of the forearm bones.

SUMMARY

We have summarized our experience with the use of medullary fixation for fractures and certain conditions of the femur and the other long bones, over a period of six years. Medullary fixation of the long bones is a highly technical, precision type of procedure, which is potentially attended by probably more difficulties and errors than any

Fig. 10A—Compound fracture of the radius and ulna with loss of all of extensor muscles and skin on dorsum of the forearm. The ulna was temporarily fixed with a Kirchner wire and loop.

Fig. 10B—Compound fracture of the radius and ulna with intramedullary pin fixation of the radius, and iliac bone grafting of fracture site, showing status of healing six months after insertion.

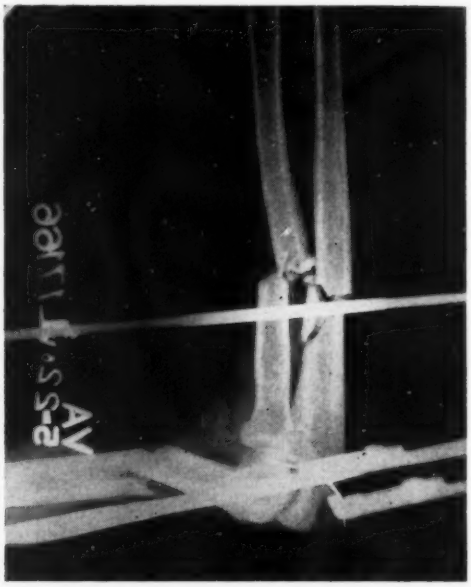

Fig. 11A—Compound fracture of the humerus, radius and ulna, treated in traction.

Fig. 11B—After the humerus healed, intramedullary pin fixation of ulna, chip grafting to ulna, and onlay graft to the radius.

other method used since internal fixation was first introduced into surgery. It hardly seems necessary to say that the procedure should be undertaken only by physicians who are experienced in the surgical care and treatment of fractures, and only in hospitals where the special facilities necessary

for the management of such cases are readily available.

When undertaken without complete understanding of the principles involved, and without proper execution of the details of the technique, medullary fixation invites disaster. But when the procedure is properly carried out, from the primary consideration of selecting the patient, to the final details of postoperative care, the patient may derive greater benefits from this method than from any other for the treatment of fractures of the long bones, particularly fractures of the femur.

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INGUINAL HERNIA*

WALTER MOSS, M. D.
LAKE CHARLES

Inguinal hernia as defined by Watson is a protrusion of abdominal viscera through the anterior abdominal wall in the inguinal region. Direct and indirect varieties occur. The direct hernia is one which comes through the abdominal wall medial to the deep epigastric vessels, which in turn are medial to the internal inguinal ring. The indirect hernia is one which passes successively through the internal ring, inguinal canal, and external ring, where it becomes superficial and often extends into the scrotum in the male, or into the labia in the female.

The inguinal canal contains the ilioinguinal nerve, genital branch of the genitocrural nerve, and the spermatic cord in the male, and the round ligament in the female. The boundaries of the inguinal canal consist of the external oblique aponeurosis throughout and the lower fibers of the internal oblique (outer third) anteriorly; posteriorly, the triangular ligament of the abdominal wall and the conjoined tendon and transversalis fascia; superiorly, the arched fibers of the internal oblique and transversalis muscles; inferiorly, the inguinal ligament and the lacunar ligament.

In the absolute normal the inguinal canal is a closed passage, the anterior and posterior walls lie in apposition except for the space occupied by the cord or round ligament. The rings both external and internal are not open but are mere slits in the muscle and fascial supports of the area.

The congenital type of inguinal hernia is the indirect type and the sac is always adherent to the cord structures.

Acquired inguinal hernia is the direct type and includes the traumatic varieties. The sac is not closely associated with the cord or its structures.

ETIOLOGY

It is universally agreed that a defect exists before strain can effect the formation of hernia. In industry it is more or less generally accepted that strain is a causative factor regardless of the well known fact that there must be a predisposing factor.

The cause of inguinal hernia has always been under contention, particularly from the medicolegal aspect. We know that weakness in the structures immediately surrounding the rings and canal predisposes to inguinal hernia. Increase in intra-abdominal tension, theoretically, causes the slitlike canal to close tighter but the presence of a preformed sac or weakness in the transversalis fascia with increase in tension from coughing or intra-abdominal pressure from other causes, will allow a knuckle of bowel to enter the ring and proceed down the canal.

It enters the internal ring through the pre-existing persistent opening of the vaginal process. This vaginal process becomes the hernial sac and is a portion of the peritoneal covering which comes down the inguinal canal with the testis in its normal descent.

A break or gradual weakening of the transversalis fascia between the rectus

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sheath and the deep epigastric artery where there is no conjoined tendon or muscle is the point of occurrence of the direct hernia which with progression protrudes into the external ring.

DIAGNOSIS

I find the diagnosis of inguinal hernia difficult in some cases. Frequently the patient is requested to return after four to seven days for a second examination. On several occasions a different conclusion was reached. The patient is disrobed and is carefully inspected while standing erect. He is requested to cough and strain. In some cases a weakness in one or both inguinal regions can be detected by simple inspection.

On inspection, the direct hernia is globular in shape and lower in position than the indirect hernia. This follows unless the hernia has progressed to the scrotal area. However, especially in thinner individuals, the funnelled portion of the sac of the indirect hernia can often be detected in contrast to the globular formation of the direct.

Either the index or middle finger is used to pick up the skin of the upper scrotum invaginating it cephalad. The finger follows the spermatic cord up the inguinal canal until it no longed palpates the cord. If the internal ring is open the end of the examining finger encounters a void which represents the abdominal cavity. (This is better demonstrated with the patient lying down). If the finger enters the ring, coughing or straining must produce an impulse or protrusion of a sac past the plane of the internal ring before the diagnosis of hernia can be made. Straining by the patient is the more satisfactory element in this maneuver if one can be certain that the patient is genuinely straining. I was once misled in a pre-employment examination by depending entirely on straining. This individual returned after working one day with a well developed hernia. I had examined him partially disrobed and in a stooped position. How he hid that big a hernia I never was able to explain to the insurance company. This was a number of years ago and I have forgotten which of my colleagues fell heir to their work.

When the dimple in the muscles of the posterior boundary of the canal can be palpated and the cord is found to disappear therein, there is no hernia. The open ring will on occasions admit the finger tip and then straining or coughing will force the finger out and a strong muscular closed ring is palpated as long as the strain is effective. If there is no palpable impulse to the tip of the finger and no structures follow the finger tip with its extrusion, there is no hernia.

The weak open ring which does not close on straining or coughing should not be classed as a hernia unless a strong impulse or beginning sac formation can be detected. The category of potential hernia has been thrust on us by industry in its pre-employment examinations. This term is used for the case with the weak ring and mild impulse with no definite sac. Potential hernia is also a term we use when we cannot decide whether a patient has or has not a hernia. That second or third examination, when possible, will often preclude the necessity of using the term.

With the examination still in progress palpation of the area medial to the ring should be done to determine whether a direct hernia exists or co-exists as the case might be. Further confirmation of whether the hernia is direct or indirect can often be made by palpating the deep epigastric vessels.

Lipoma or large collections of normal fat in the inguinal canal will often confuse the examiner. Hydrocele of the cord can be ruled out by transillumination. In evaluating the symptom of pain in suspected cases of inguinal hernia I wish to emphasize the necessity for rectal examination. Prostatitis with vesiculitis and associated vasitis are aften overlooked. Neuromyositis due to prostatitis is often the reason for pain in the inguinal region. Vasitis or neuromyositis, or both, following surgery, frequently cause the patient to have pain in the operative area. The occurrence of this symptom is always a reason for deep concern to the

patient as well as to the surgeon.

In six individuals, I have observed an area 2 to 4 centimeters lateral to the internal inguinal ring where a split in the external oblique, internal oblique, and transversalis has occurred. There was a definite sac and the area was tender and painful. The hernia occurred in each case with a history of unusual strain followed by burning pain in the area, which was persistent. One of these cases was found to exist in a patient who had been operated on for an inguinal hernia of the indirect type. All of these individuals had a noticeable bulge in this area lateral to the inguinal ring when straining while standing. Curiously enough, a number of thin individuals have been observed to have a bulging in this area on straining or coughing when no such hernia exists.

Interstitial hernia, as described by Watson, is a hernia that lies in one or the other of the planes of the abdominal wall. Bartholin observed the first recorded case in 1661 and called it "bubonocele rara" (Watson). This was a large mass dissecting between planes of the abdominal wall toward the spleen. Lower and Hickens described these an interparietal hernias.

There are four varieties of interstitial hernia (Interparietal): (1) Properitoneal, (2) intermuscular, (3) inguinosuperficial, (4) external supravesical.

The occurrence of strangulation and the presence of multilocular sacs are the important factors in treatment of these hernias.

I thought that this atypical hernia might be classified as an interstitial hernia but the definition of interstitial hernia implies dissection by the sac between the planes of the abdominal wall and this hernia apparently comes directly through the fibers of the transversalis, the internal oblique and then through a split in the external oblique and is found as a direct protrusion under the skin in a globular form. It reduces easily; in fact, as soon as strain is removed or the patient lies down. In the supine position the opening can be palpated and impulse can be felt by the examining finger when the patient strains. These could be early inguino-superficial hernias.

TREATMENT

The treatment of inguinal hernia consists of the repair of torn structures or substitution of material either autogenous or foreign to replace nonexistent or weakened structures which no longer are capable of withstanding the intra-abdominal pressure into the preformed sac.

High ligation of the sac is of primary importance in proper repair of any hernia. Careful attention must be paid to the layer of sutures used in approximating the transversalis to the inguinal ligament. This is more important than approximating the conjoined tendon to the inguinal ligament. Frequently, especially in fat individuals, the transversalis is deficient in this area and the conjoined tendon must be used. The most desirable technique is to fix both the transversalis and the conjoined tendon to the inguinal ligament with separate layers of sutures.

Transplantation of the cord is a very important maneuver in the proper correction of hernia. The tight closure of muscles about the cord which then runs between internal and external oblique muscles is a stronger buttress against possible recurrence than is the cord in its normal position. Some authors argue the unimportance of this maneuver.

Suture materials vary with some variation in the results. At present, more satisfactory results are obtained with the use of nonabsorbable material. Catgut still has its proponents and many surgeons adhere to its use. Silk and cotton are popular in different sections of the country.

Recently, we find that metal wire is becoming more and more popular (Babcock). As suggested by Elmquist, absorbable suture material can be used in the same wound with metal wire with no deleterious effect. Wire, number 32 to 35, is used, one length to each suture and the knots are stable. The wire is cut on the knot and is stronger than other suture material. The wire is cut right at the knot to avoid over-extending wire

ends. There is no slough and no sinuses occur.

Fascial transplants by employing the use of rectus sheath fascia or fascia lata as interlacing weaving type sutures have been used since they were popularized by Gallie and others. Koontz discovered that ox fascia preserved in alcohol could be used where deficiency in fascia existed. These transplants are found to be better than fascia placed on tension, as sutures cut through and cause slough.

Where extensive fascial and muscular deficits exist tantalum mesh is recommended by Koontz and steel mesh by Babcock. I have had no experience with the use of this material but recent reports of the use of metal mesh as substituting material are encouraging.

The injection treatment, which consists of injecting sclerosing solutions into the sac, is mentioned for two reasons. First for the historical significance because of its use by Velpean in 1835 and Pancoast in 1836. It was discarded after surgical methods were introduced by both Bassini and Halsted. The work of these surgeons is well known to all. The second reason for mentioning the injection treatment is to call your attention to the excellent treatise on the subject by Koontz in Lewis' *Practice of Surgery*. He recommends its use in selected cases in which surgery is contraindicated or not justified for other reasons. One important point that he emphasizes is that injection treatment should be used only by surgeons who have adequate knowledge of the anatomy of the area which they have learned through the experience of many surgical procedures for hernia. It is not used in complicated hernias such as the irreducible variety.

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RECENT DEVELOPMENTS IN THE DIAGNOSIS OF RENAL TUMORS*

FRANK C. HAMM, M. D.
HARRISON C. HARLIN, M. D.†
BROOKLYN, NEW YORK

Tumors arising from the kidney are predominantly malignant and, therefore, must be considered as such unless conclusive evidence to the contrary can be established. This is not always an easy undertaking. In fact, to ascertain conclusively that the kidney harbors a tumor at all, at least one in an early stage, may be a difficult and painstaking task.

Pain, abdominal tumor, and hematuria constitute the principal symptoms that attract attention to the urinary tract. Pain may be of two types: (a) sharp and colicky due to the passage of a small calculus, or (b) dull and aching in character. In one of our cases, the diagnosis of carcinoma of the kidney was established from a pyelogram made routinely following the passage of a small calculus.

In order to study an abdominal tumor, the urinary tract is visualized as the first step in the examination. Several advantages accrue from this action. It is one of the easiest procedures, and frequently gives valuable information even when the tumor arises from structures outside of the urinary system. Pyelograms may indicate the approximate site of origin, and indicate whether the tumor arises from within the peritoneal cavity or from the extraperitoneal space. If the intestine is studied first,

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†From the Departments of Surgery (Urology) of the Veterans Administration Hospital, Brooklyn, New York, and The Brooklyn Hospital.

a delay of several days may be caused by barium remaining in the bowel.

Hematuria is a most important symptom. The urgency of investigating the cause of all instances of blood in the urine, whether gross or microscopic, cannot be exaggerated. In our experience, a malignant tumor somewhere in the urinary tract is found in about one-half of all patients presenting themselves because blood had been noted in the urine. It may even be a capricious symptom appearing once, never to recur.

In discussing the newer adjuncts to the diagnosis of renal tumors, it may be stated at once that they do not replace or supplant pyelography. The majority of diagnosis of renal tumor can be made from a good retrograde pyelogram. The newer methods are supplementary, and are used only in obscure cases when the diagnosis cannot be established definitely by less elaborate procedures. They are:

1. *Exfoliative cytology*, or the study of the cellular constituents of urine.

2. *Perirenal insufflation*, or the introduction or injection of air, oxygen, etc. into the retroperitoneal space, thereby aiding in the delineation of the kidneys and adrenals.

3. *Translumbar arteriography*, or the injection of a radiopaque medium into the aorta, which has the effect of visualizing the great vessels of the abdomen in general and specifically the vascular pattern of the kidneys.

1. EXFOLIATIVE CYTOLOGY

In instances of renal hematuria, when the malignancy is present in an early form and is not large enough to produce distortion of the pyelogram, a study of the cell content of the urine may be of great value. This modality has recently received impetus through the work of Papanicolaou and his associates. It is based on the knowledge that the rate of exfoliation of cells is more rapid from a malignant process than from normal epithelium. Care must be taken in the collection of the specimens as the cells in urine deteriorate rapidly. A freshly voided specimen may be used, or a large ureteral catheter may be passed to the renal pelvis of the kidney under suspicion, and washings with sterile physiologic saline solution made. The urine or washings obtained are immediately mixed with an equal quantity of alcohol, 70 per cent, and delivered to the laboratory without delay. The most important member of the team making this type of study is the pathologist who must recognize the presence of malignant cells. Large numbers of pus or blood cells may add to the difficulties of examining the specimen.

It may be fortunate if a piece of tissue becomes caught in the eye of the catheter; the actual cell pattern may then be examined. An instance of this type occurred recently. A white man aged 22, entered the Veterans Administration Hospital with the chief complaint of hematuria, an episode having been noted for the first time five months prior to admission. During cystoscopic examination, blood was seen to be emerging from the right ureteral orifice. A ureteral catheter was passed to the right renal pelvis, a specimen collected, and a pyelogram made. On withdrawing the catheter, a small piece of tissue was seen to be caught in the eye of the catheter.

Exfoliative cytology, in certain instances such as that just related, has been of inestimable value and may be credited with making a diagnosis otherwise impossible (Fig. 1). A failure to find malignant cells obviously cannot be interpreted as evidence that malignancy is not present, as cells would be present in the urine in only a relatively small percentage of cancers of the kidney, namely, those that arise from the epithelium of the renal pelvis or those arising in the parenchyma and involving the epithelium by extension.

2. PERIRENAL INSUFFLATION

The second modality for discussion is the injection of air into the tissues surrounding the kidneys. This is of value in determining their size and shape when disease in the parenchyma is suspected or known to exist. It may also be useful as an aid in the visualization of adrenal glands or tumors arising from any of the retroperitoneal structures. The shadows cast by X-rays indicate the varying densities of the body, so that air in

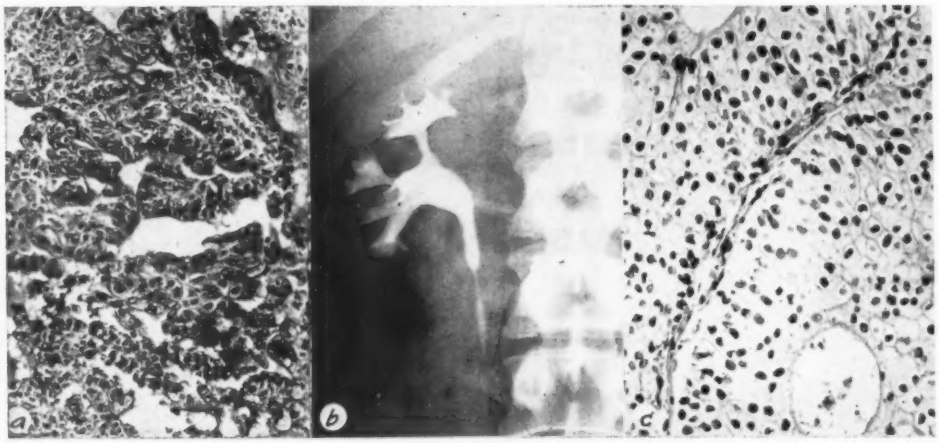

Fig. 1. (a) A biopsy specimen of tissue caught in the eye of the catheter. (b) Pyelogram: arrow points to affected calyx. (c) Microscopic section of lesion obtained by nephrectomy.

the retroperitoneal tissues will usually demonstrate sharply an irreguarity of renal outline. This procedure was introduced by Carelli, in 1920, and revived by Cahill in 1935, in the course of his investigation of adrenal tumors. Between the years, it had been all but discarded because of untoward reactions such as air embolus, pneumothorax, and paroxysmal coughing.

As the technique was used originally, a long needle was inserted through the lumbar area directly into the perinephric tissues, and approximately 500 cc. of air or oxygen injected. Although this procedure was of value as an aid in outlining the renal shadow, it was approached with a feeling of uneasiness due to the hazard accompanying the injection of air into an area containing large and important blood vessels.

During the past year, we have used a technique of injecting air anterior to the coccyx; it is simple, apparently without danger, and requires no special equipment. However, a knowledge of regional anatomy is important. The rectum is approximately 5 inches long. It begins at a point opposite the center of the sacrum, follows the curve of the sacrum and coccyx, and ends about an inch beyond the tip of the latter. Peritoneum covers the anterior surface and sides of the upper one-third, but covers only the anterior surface of the middle one-third. It is reflected on to the bladder or vagina, forming the bottom of the rectovesical or rectovaginal pouch. The lower one-third of the rectum is situated below the level of the peritoneum, imbedded in fat and fascia. In this area, which contains no important blood vessels or nerves, the needle may be inserted without fear of damage.

To employ the method of injecting air anterior to the coccyx, the patient is placed on his abdomen and the sacrococcygeal area, along with the medial portions of the buttocks, are prepared in an aseptic manner. The index finger of the left hand (in a right-handed individual) is introduced into the rectum, the tip of the digit being approximately at the midcoccygeal area. Gentle pressure is applied to the posterior wall of the rectum in order to feel the point of the needle at all times. After a local anesthetic has been injected, an 18-gauge spinal needle is inserted at the level of the palpating finger tip in the rectum which will be a point about 1½ inches from the midline. The needle is directed anteriorly and medially until the lateral surface of the coccyx is encountered, and is then continued anteriorly along the side of the coccyx until it rests between the rectum and the bone in the midline. In this position, the tip of the needle can be palpated easily through the wall of the rectum thus avoiding perforation of this structure while the air is being injected.

A three-way valve is attached to the

needle, followed by a 75 cc. syringe and a piece of tubing connecting with the oxygen supply. After the final precaution of aspiration, oxygen is injected. By using about 1000 cc., gratifying results have been obtained. On the roentgenogram, the oxygen is seen to extend from the region of the sacrum up both sides of the retroperitoneum. The advantages of bilateral visualization over the more serious unilateral technic are obvious (Fig. 2).

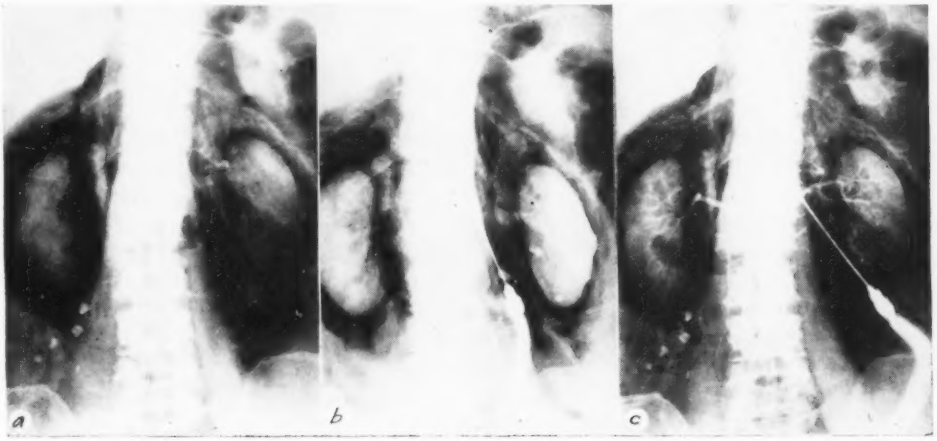

Fig. 2. (a) Bilateral simultaneous perirenal insufflation by the paracoccygeal route. (b) Demonstration of "nephrogram effect" in combination with arteriography (same case). (c) Demonstration of arteriogram (same case). Note double renal arteries on both sides.

While this procedure is not original with us, having been introduced by Rivas, we feel that we have increased its value by the accurate placement of the needle made possible by the continuous guidance of the finger in the rectum. In our experience, its greatest usefulness has been in combination with translumbar arteriography. It has been used in more than 120 cases without a serious accident.

3. TRANSLUMBAR ARTERIOGRAPHY

This represents a new approach to the study of renal disease by allowing roentgenographic observation of the external and internal renal vascular pattern. The procedure is not new in the sense that it has recently come into existence, since it was originally introduced by dos Santos in 1929. In the early days of its usage, the employment of toxic contrast media such as sodium iodide, followed by complications which were sometimes fatal, eventually caused the method to fall into disrepute. Recently, however, Smith and his associates, utilizing newer and less toxic contrast media, have given impetus to the revival of this diagnostic procedure. It has proved useful and without serious effects, at least, none has been encountered to date.

The necessary equipment is simple, consisting of the following:

(a) One 6 inch, 16 F needle with stylet.

(b) Approximately 18 inches of pressure resistant rubber tubing with an adapter firmly secured at either end. One end is attached to the needle after it has been introduced into the aorta.

(c) A suitable syringe of sturdy construction.

(d) Radiopaque solution, 75 per cent.

(e) Materials for aseptic preparation and draping of the patient.

The patient is placed on his abdomen, and a plain roentgen film is taken to determine the accuracy of the position. As a preliminary measure, one-half of 1 cubic centimeter of the contrast media is injected intravenously to test for possible sensitivity. If no toxic manifestations develop, the patient is anesthetized with intravenous anesthesia. The lumbar and lower thoracic regions are then prepared and draped in an aseptic fashion. A point is marked under the lower border of the twelfth rib, approxi-

mately eight centimeters from the vertebral spine for the insertion of the needle which is directed anteriorly, medially and cephalad until the body of the vertebra or the transverse process is encountered. It is then withdrawn for a short distance and reintroduced with a slight backward and forward motion until the tip slides off the ventrolateral edge of the vertebral body. The stylet is then removed, and the needle is slowly moved forward until there is a sudden release of resistance, signalling entrance into the aorta. Entrance is easily recognized by the characteristic spurt of blood. The syringe with the attached tubing having been previously filled with about 20 cc. of iodine medium, 75 per cent, is then attached to the needle. A column of blood entering the syringe is assurance that the tip of the needle is still within the aorta. The contents of the syringe and the tube are rapidly injected into the aorta, completing the injection in two or three seconds. The roentgen exposure should be made as the last few cubic centimeters of fluid are injected. It is important that the firing of the x-ray tube should be independent of the rotating anode so that the former is at the operator's split-second control.

Practiced teamwork is required for smooth operation. After the original exposure, following the injection of the contrast medium, the cassette is changed, and another exposure is made as rapidly as possible in order to record the nephrogram effect. As soon as the injection is completed, the stylet is replaced in the needle. The films are rapidly processed; if they do not prove satisfactory we repeat the injection if there is no contraindication. The needle is then removed.

Interpretation of the roentgen findings depends on repeated experience with the procedure. While all of the branches of the abdominal aorta which emerge below the diaphragm are not always outlined by the contrast medium, a thorough knowledge is essential of the position and course of the vessels which may be visualized. In the study of translumbar arteriograms, attention is centered on the renal vascular architecture. The renal vessels branch from the aorta approximately at right angles near the level of the second lumbar vertebra, the left is usually at a slightly higher level than the right. The first division of each renal artery occurs close to or within the hilum of the kidney, and from this point branches spread throughout the kidney with diminishing caliber, the end branches forming the so-called fanlike arrangement. The presence of more than one renal artery is not uncommon. Correlation of the vascular pattern with the nephrogram, in which the functioning renal parenchyma is opacified, completes the arteriographic study.

Arteriography probably serves its most useful purpose in the differentiation of renal cysts, simple and polycystic, and renal tumors. A cyst of the kidney is avascular. It overlies or displaces renal parenchyma. The arteriographic study, therefore, would be expected to disclose any or all of the following:

(a) Irregularity of outline of the kidney, or a displacement of the intrarenal vessels adjacent to the parenchymal portion of the mass.

(b) A relatively clear or avascular area corresponding to the area of the mass adjacent to the opacified parenchyma on the nephrogram.

(c) No collection of contrast medium within the area of the mass.

These features are demonstrated in Fig. 3.

The majority of renal tumors, on the other hand, are richly vascular, and there is characteristic "puddling" and "laking" of the contrast medium in the area of the mass. The vessels adjacent to the mass may be displaced, but branches are usually seen to enter it (Fig. 4).

No serious complications have been encountered, although inadvertently the contrast medium has been injected directly into the celiac axis, the superior mesenteric artery and the left renal artery. Intramural and extramural extravasation of the contrast medium has been observed without sequelae. One instance of mild pneumothorax cleared spontaneously.

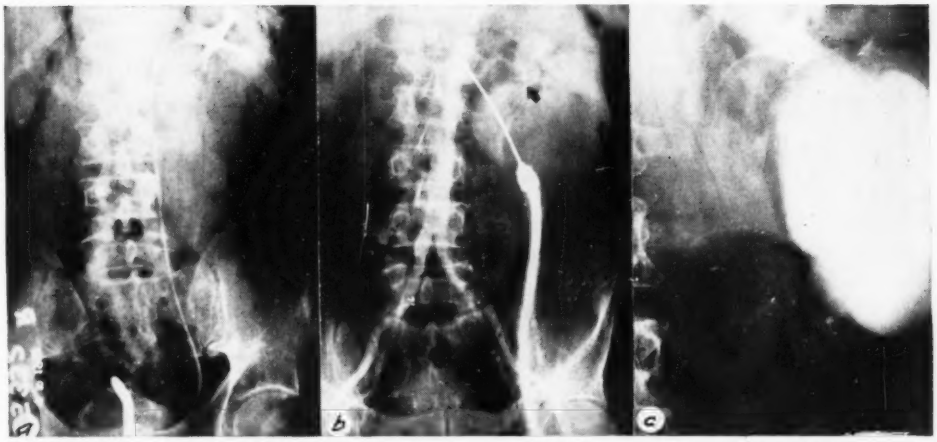

Fig. 3. Renal cyst. (a) Pyelogram displaced by mass arising from lower pole of kidney. (b) Arteriogram (came case). Arrow points to renal vessels surrounding mass. Avascular area in the lower pole of the kidney is characteristic of solitary cyst. (c) Contents of cyst have been aspirated through a needle and replaced by radiopaque medium.

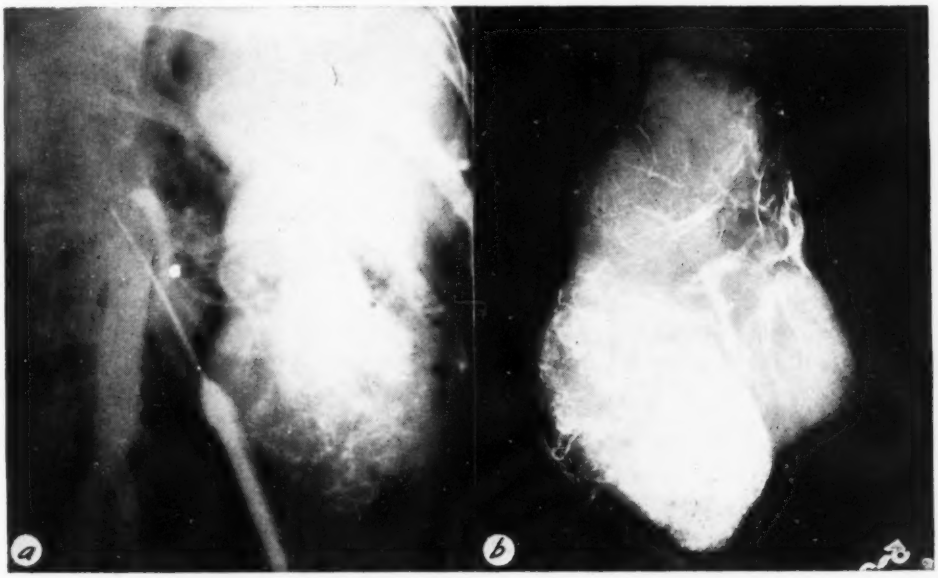

Fig. 4. (a) Arteriogram demonstrating characteristic "puddling" and "laking" of contrast medium in a case of renal malignancy. (b) Roentgenogram of kidney removed by nephrectomy. Arterial system of specimen has been injected with an opaque medium.

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80 Hanson Place

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EFFECTS OF CALCIFIED LYMPH NODES PERFORATING THE BRONCHIAL TREE*

MORTON M. ZISKIND, M. D.†
NEW ORLEANS

Calcified lymph nodes are seen at the pulmonary vascular roots on many chest x-ray films. When the calcific nucleus of one of these nodes migrates through the adjoining bronchial wall toward the lumen, it produces effects which become clinically apparent. The wandering calculus is called a broncholith and the disease which it produces is termed broncholithiasis. This paper will be concerned with the principal effects of these stones upon the bronchi, lungs, and pleura.

Increased interest has developed in recent years concerning this subject because of advances in roentgen diagnosis and thoracic surgery, and several large series of cases have been reported.[1-4] It is now evident that broncholithiasis is not an uncommon disease and that its early recognition is important if prolonged bronchial obstruction leading to pulmonary and pleural suppuration is to be avoided. With prompt relief of bronchostenosis, the morbidity and mortality associated with broncholithiasis should be reduced and the indications for pulmonary resection, which may be difficult and extensive in this disease, should become less frequent.

MATERIAL

This paper is based upon a series of 65 cases gathered over a period of twenty years at the Mount Sinai Hospital of New York.[4] Stones were recovered from 33 of these patients; the diagnosis of broncholithiasis was made in the remaining cases since they presented the same clinical and roentgenographic features as the proven group. Most of the patients in both groups were in the cancer age; only 4 were less than 20 years of age. No difference in sex incidence was noted.

PATHOGENESIS

Before considering the effects of eroding broncholiths, their origin will be briefly discussed. The development of broncholithiasis and its most frequent locations are determined by the relations of the bronchopulmonary lymph nodes and the segmental and lobar bronchi. Nelson[5] and Head and Moen[1] demonstrated that lymph nodes were constantly present near the origins of the middle lobe and lingula bronchi and of the anterior segmental bronchi of the upper lobes but were only irregularly associated with the other segmental branches. The designated bronchi are the principal sites for perforating caseous and calcific lymph notes in the adult.

The development of broncholiths in these positions is favored by several factors. Lymph nodes are constantly present at these points. These nodes are focal points for the drainage of infection from the lung toward the mediastinum. The middle lobe and lingula nodes drain the right middle and the lower lobes while the glands in relation to the anterior divisions of the upper lobe bronchi drain the upper lobes. Tuberculous lymphadenitis secondary to primary foci within the lungs will involve these nodes.

The proximity of these nodes to the bronchi makes it possible for caseous tuberculosis to spread through the capsule of the lymph node and invade the bronchial wall. Such involvement of bronchi of varying caliber has been noted frequently in patients with active primary complexes. Since the bronchi of children are smaller and weaker than those of the adult, perforation of main and lobar bronchi by caseous lymph nodes is far more common in the young. In the adult, tuberculous lymph nodes usually perforate into the small anteriorly situated segmental bronchi.

Though caseous disease is responsible for the original damage to the bronchial wall in broncholithiasis, active tuberculosis is

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†From the Department of Medicine, Tulane University School of Medicine, and the Charity Hospital of Louisiana at New Orleans.

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rarely present when the calculus perforates the bronchial wall. After healing of the tuberculous process has taken place, the bronchial wall remains permanently weakened and migration of the calcified core of the diseased lymph node toward the lumen is favored by the respiratory motion of the bronchus.

It is not necessary for the calculus to penetrate the mucous membrane to produce bronchial obstruction with its pulmonary and pleural complications. The calcification is often confined to the bronchial wall while an overlying inflammatory stricture narrows the lumen. By bulging toward the lumen the calcified mass may increase the obstruction caused by the stricture. Erosion by the stone or vascularity of the inflammatory stricture is responsible for hemoptysis in this disease.

In summary, the development of broncholithiasis is determined by the presence of fixed groups of lymph nodes which are frequently involved by caseous tuberculosis. The high incidence of the disease in the middle lobe and the anterior segmental bronchi depends upon these anatomical and pathological facts.

THE EFFECTS OF BRONCHOLITHIASIS

Bronchial obstruction is the most common effect of perforating lymph nodes. Its presence is suggested by the presence of a contracted segment or lobe on the roentgen film and is usually confirmed by bronchoscopic examination. Table 1 lists the bronchoscopic findings in our series.

TABLE 1
BRONCHOSCOPIC FINDINGS
54 CASES

Stones removed	14	39
Strictures and bulges	22	
Thickened spur	2	
Ulcer	1	
Pus from segmental bronchus	12	15
Negative	3	

5 patients spat up stones after bronchoscopy
Bronchoscopic confirmation of clinical diagnosis in 39 of 54 cases = 76%

Where the obstruction lay outside the bronchoscopic field, it was usually demonstrated by lipiodol instillation. In several patients who had expectorated stones previously, bronchostenosis could not be demonstrated. Obstructing stones were found at autopsy in 2 patients who died of unrelated disease. The presence of obstruction could not be verified in several patients under treatment for other diseases, whose condition made bronchoscopy and bronchography inadvisable.

The close association of bronchial involvement and chronic coughing was again noted in our series. Only 3 cases, all unproven, lacked persistent cough. In the other patients it was usually one of the first symptoms. Cough was productive of purulent sputum in 46 of the 65 cases. Foul sputum was present in 9 cases; stones were recovered from 8 of these patients.

Hemoptysis was a very common symptom; it was present in 45 cases. It was the first symptom in one-third of the patients. Twenty patients had large hemorrhages; these patients usually had calculi obturating the bronchial lumen. Their case histories suggested that massive bleeding often occurred at the time that the stone was extruded into the lumen.

Atelectasis was almost invariably present in our patients. At least one zone of contracted lung was seen on the films of 63 of our patients; 1 of the remaining patients had a tracheolith and the other showed involvement of the right anterior segmental bronchus.

Table 2 demonstrates that segmental collapse was far more common than lobar or whole lung involvement. It also shows that the middle lobe and anterior segmental bronchi are predominantly damaged by this disease.

TABLE 2
SITES OF ATELECTASIS—65 CASES*

Middle lobe	29	Most common	
Anterior upper lobe and lingula	18	47	74%
Posterior upper lobe	4		
Apex lower lobe	2		
Anterior basal	2	9	Other segments
Lateral basal	1		
Upper lobe	4		
Lower lobe	3	8	Larger bronchi
Main bronchus	1		

*(One patient with 2 segments involved)

Severe and recurrent infection of the lung distal to the point of obstruction is

extremely common in broncholithiasis. The 33 proven cases will be used to illustrate these effects since inflammatory changes were more severe in this group and were often verified at operation and autopsy. Twenty-two of the proven cases had chronic or recurrent infection. In 6 instances lung abscesses were demonstrated. Bronchiectasis was present in 5 other cases. Severe pulmonary suppuration and lung destruction are frequent complications of prolonged bronchial obstruction. The findings in our series suggest that destructive changes are more marked when the broncholith lies within the bronchial lumen.

Since the entire pulmonary zone supplied by the obstructed bronchus is usually infected, inflammation of the pleura and empyema will often develop. Four of our patients were admitted with obscure empyemas and a fifth case was complicated by a sympathetic pleural effusion. An underlying lung abscess was present in 3 of these cases. In one instance the abscess ruptured into the pleura, producing a pyopneumothorax which was further complicated by the development of suppurative pericarditis.

Besides these serious effects upon bronchus, lung, and pleura, calcified lymph nodes may damage other intrathoracic structures. In 1 of our cases, carinal nodes produced esophageal stenosis. Eroding broncholiths may produce esophagobronchial fistula as reported by Maier.[6] The common association of inflammatory stricture of the middle lobe bronchus with traction diverticula of the esophagus has been recently reported by Katz.[7]

Since the calcified lymph nodes are also intimately related to the pulmonary arteries at the lung roots, the vascular wall may become adherent to the eroding broncholith. Soave[8] has reported the occurrence of a fistula between the middle lobe bronchus and a branch of the right pulmonary artery produced by an adherent anthracotic lymph node. Arnstein[9] has collected a number of cases in which calcified and anthracotic lymph nodes eroded pulmonary arteries in older patients and caused death by hemorrhage and asphyxia. The matting together of the root structures in this disease often makes surgical treatment difficult and makes segmental excision especially hazardous. Two of our patients underwent pneumonectomy because arteries were torn in the course of middle lobe and segmental resections.

DIAGNOSIS

The diagnosis of broncholithiasis must be considered when dealing with the problems of hemoptysis, chonic cough, recurrent pulmonary infection and empyema of unknown origin. Under such circumstances, the demonstration of lymph node calcification on the x-ray film should raise the suspicion that broncholithiasis exists. If doubtful radiological shadows are present, films should be taken with the Bucky or tomographic techniques to determine if calcium is present.

A presumptive diagnosis of broncholithiasis can be made if the roentgen views demonstrate that the calcification lies at the root of an atelectatic segment or middle lobe. Films in appropriate projections, lateral and oblique, must be taken to demonstrate this relationship because the middle lobe and the segments are often difficult to define on the conventional posteroanterior view. Calcification at the root of a contracted lobe or lung is not a good basis for the presumptive diagnosis of broncholithiasis; other lesions produce lobar and multilobar atelectasis far more frequently and the calcified node is often coincidental in such cases.

The diagnosis of broncholithiasis is usually confirmed by the finding of bronchostenosis at bronchoscopy. Where the obstruction is beyond the bronchoscopic field, it can be demonstrated by lipiodol instillation. However, bronchoscopic confirmation is more reliable than that furnished by bronchography for the operator will take a biopsy from the area of stenosis and will often remove the stone. Repeated biopsies from the zone of narrowing which show no neoplastic tissue effectively exclude the presence of malignant and benign bronchial tumor.

Bronchographic confirmation of broncholithiasis is reinforced if the patient's symp-

toms are of long duration or if old films are available which show the same pattern of calcification and segmental or middle lobe atelectasis. A benign bronchial tumor is not excluded by these findings.

The diagnosis of broncholithiasis is established when a broncholith is recovered. Before the development of bronchoscopy and modern thoracic surgery, stones were obtained only by expectoration and removal post mortem. Table 3 indicates that almost half of our stones were obtained at bronchoscopy or were expectorated following bronchoscopic manipulation.

TABLE 3
INDICATING MANNER IN WHICH BRONCHOLITHS WERE FIRST OBTAINED

Bronchoscopy	11
Surgical resection	8
Autopsy	6
Expectoration post bronchoscopy	4
Expectoration before bronchoscopy	4
	33 cases

In several cases, repeated bronchoscopic examinations were required before the broncholith was removed. In other cases, multiple fragments were present which made repeated operations necessary. The presence of additional calculi can be detected on overexposed x-ray films.

The patient should be questioned concerning the expectoration of stones when first seen. Head and Moen,[1] Brock,[3] and Rabin[4] have all treated patients who failed to volunteer that they had coughed up stones. Brock's patient produced a match box full of calculi when he was directly questioned. Since the diagnosis can be established through the history at the first meeting, information concerning the expectoration of calculi should be explicitly sought for.

The presence of reactivated tuberculosis within the calcified lymph node is uncommon; it occurred in only one of our cases. It will usually be discovered on routine smears for acid-fast bacilli or when a bronchoscopic biopsy is taken from the stenotic lesion.

The presence of bronchostenosis will exclude nonobstructive bronchiectasis and aspiration lung abscess. Biopsies taken from the stenotic area which contain no neoplastic tissue effectively exclude malignant and benign tumor since adequate samples taken from these lesions are invariably positive.

TREATMENT

Broncholithiasis is a disease which produces serious complications and carries a definite mortality. Eight of our 33 proven cases died of causes related to broncholithiasis. Massive hemorrhage, gangrenous pneumonia, pyopneumothorax, and suppurative pericarditis were among the causes of death and indicate the necessity for early diagnosis and treatment for this disease.

Early treatment will aim at relieving the obstruction of the bronchus, and preventing pulmonary suppuration and destruction. Early bronchoscopic examination is essential in this disease if pulmonary tissue is to be conserved.

Pulmonary resection is indicated in those cases in which the lung is irreparably damaged and in patients subject to massive life-endangering hemorrhages. Patients with empyema will require surgical drainage before the underlying pulmonary lesion can be treated.

Pulmonary resection or pleural drainage was necessary in 14 of our 33 proven cases. This represents a high incidence of severe complications of broncholithiasis, which is in part accounted for by the long duration of symptoms and the large number of intraluminal stones in our series. It is to be hoped that earlier diagnosis of this condition and prompt relief of bronchial obstruction will result in fewer cases which require surgical treatment.

SUMMARY

1. Broncholithiasis is an important cause of hemoptysis and pulmonary and pleural suppuration.

2. Broncholiths arise from calcified post-tuberculous lymph nodes which erode the bronchial wall.

3. Anatomical relationships favor the erosion of the calculi into the bronchi of the anteriorly located segments and the middle lobe.

4. A presumptive diagnosis of broncholithiasis is based upon the roentgenographic

demonstration of a calculus at the root of a collapsed segment or middle lobe.

5. The diagnosis is most frequently confirmed and verified at bronchoscopy.

6. Early treatment aims at the relief of bronchial obstruction and the conservation of pulmonary tissue.

7. Surgical therapy is indicated for recurring large hemorrhages and pulmonary and pleural suppuration.

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Note: I take this opportunity to express my gratitude to Dr. Coleman B. Rabin of the Mount Sinai Hospital, New York, who originated and directed this study, for his kindness in giving permission for the publication of this paper.

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Medical and Surgical Journal

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THE PHYSICIAN AND THE RELATION BETWEEN MEDICINE AND THE PRESS

Over a matter of generations the attitude of the physician toward the press has undergone an evolution through stages of indifference, antagonism, tolerance, and more recently—active cooperation. The attitude of cooperation has been engendered through the realization of the need for the health education of the public, of the need for improved public relations on the part of medicine as a whole, and more recently, by the realization that in the National Educational campaign undertaken by the American Medical Association more than 99 per cent of the papers of the country were with the medical profession against compulsory health insurance and against any of the indirect advances of communism that might threaten the freedom of the press, as well as the freedom of medicine. The attitude of the average doctor towards the press, in the abstract, may be crystallized by his most recent contact with some phase of newspaper activity, which may be either one of admiration for the service of the press in focusing public opinion on an important topic, or of antagonism for publicity in which the individual physician or the profession as a whole was held at fault.

In a recent address by Dr. Louis H. Bauer, President of the American Medical Association, it was stated: "We are proud to have the press as our ally in our fight for freedom. We are proud to be your allies in defending freedom of expression in our country."

With this in mind, it will become a source of some concern to realize that in a survey in one of the western states by the press association, it was finally stated that the greatest barriers to news were the doctors and hospitals. The reasons for physicians assuming the attitude of obstruction to news are understandable. Many doctors have been embarrassed by having the first news of an important drug or discovery presented to them in the form of a question by a patient, who had just read of it in the newspaper or a national weekly the hour before. Many physicians, also, resent the unfavorable display of a circumstance, in which one doctor may have been delinquent, in such a way as to cast reflection on the activities of the profession as a whole.

The explanation for such seemingly unhelpful types of medical publicity as these is worthy of consideration. In the first instance, there is keen public interest in all matters that concern medicine, and there is strong desire on the part of the public for knowledge of the progress of medical science. This has been intensified in recent years by what seemed to be startling and rapid advances. Actually, there is no way to prevent medical news delivered in address-

es or in publications from being disseminated. Medical meetings are open and libraries are open. Exclusion of reporters from medical meetings would only result in their having recourse to journals. As will be presented in this discussion, reporters should have medical assistance when they are considering an address or consulting an article.

In the second instance in which unfavorable comment causes resentment, the press is not actually responsible. The press would not present circumstances in a derogatory light if they were not satisfying the public's appetite for something of a defamatory character. This is due to our bad public relations in the past. This attitude was made possible by the fact that no organized effort has been made to improve them. By way of contrast, it should be remarked that adverse publicity is not suffered by members of the ministerial profession. The newspaper that would make a display of an exceptional case would be so criticized as to bring reflection on itself. We must then realize that newspaper and other publishing is a highly technical business which is competitive in the extreme, and is most susceptible to public opinion. And while newspapers may do much to mold opinion, they are also molded by it. Physicians must also come to learn that what the public knows and how the public feels towards the medical profession depends to a large extent on sources of information and how facts are presented. Accordingly, if we make desired medical information available to the press, we can avoid, in some measure, public ignorance and public misunderstanding. The "Principles of Medical Ethics of the American Medical Association" state in this connection:

> "The medical profession considers it ethical for a physician to meet the request of a component or constituent medical society to write, act, or speak for general readers or audiences. The adaptability of medical material for presentation to the public may be perceived first by publishers, motion picture producers or radio officials. These may offer to the physician opportunity to release to the public some article, exhibit, or drawing. Refusal to release the material may be considered a refusal to perform a public service, yet compliance may bring the charge of self-seeking or solicitation. In such circumstances the physician should be guided by the decision of official agencies established through component and constituent medical organizations."

Recognizing the importance of full cooperation between physicians and the press, many of the state and county societies have adopted a Code of Cooperation, setting forth a workable policy on medical news which would satisfy both sides. The Colorado State Medical Society's Code, which has served as a model for Codes adopted in many of the other states, sets up a system of official spokesmen for each county society—usually the president, secretary, and publicity chairman. The thought along these lines is that the average physician will sooner or later have occasion to meet with the press. That the physician may have adequate guidance in such contacts, and that the reporter may have sufficient assistance to present the medical point of view, is the reason for setting up such a committee. It is desirable that these committees have the authority to act quickly. In some instances, it has been found best that there should be a sort of medical public relations interpreter. It may be a physician with knowledge of press matters, or it may be a newspaper man of experience, who has familiarized himself with the medical point of view. In these connections, it is practically essential from the point of view of the newspaper to lend authenticity to a statement that the physician, or someone in authority, should be quoted. In such circumstances, the action of the spokesman "shall not be considered by their colleagues as a breach of the time-honored practice of physicians to avoid personal publicity, since it is done in the best interests of the public and the profession." Anonymous pro-

nouncements fall flat where the medical education of the public is concerned. It has appeared desirable in the handling of state and national meetings that special plans be made in order that science writers and medical reporters may have adequate contact with the essayists and opportunity to review the papers. In some instances, mimeographed copies are supplied; in others, abstracts. In either case, it seems necessary that the medical organization should provide an interpreter whose business it is to assist the reporters in getting an understanding of the medical point of view.

Where an interview is sought, or a photograph desired, there is some hesitation on the part of the essayist in acceding to these demands. The best thought on the subject is that, under such circumstances when there is some doubt, the physician could have recourse to the listed chairman of the organization or to the regulations chairman of the medical society in the local city.

It is considered unethical for a physician to furnish a story or picture on his own initiative to newspapers or magazines, as this smacks too much of self-seeking publicity. On the other hand, if data have been or are being presented publicly in lay or scientific meetings, it is considered ethical if the physician works through the publicity committee or public relations man of his local society. In that way, his colleagues are his judges and, in abiding by their judgment, he cannot be accused of being a publicity seeker.

With these considerations in mind, it is seen that with the demands of the public for medical knowledge and with the necessity for better public relations on the part of the profession as a whole, every effort should be made to see that the public gets accurate knowledge and gets the physician's point of view.

ORGANIZATION SECTION

The Executive Committee dedicates this section to the members of the Louisiana State Medical Society, feeling that a proper discussion of salient issues will contribute to the understanding and fortification of our Society.

An informed profession should be a wise one.

1953 ANNUAL MEETING

Dr. Cuthbert J. Brown has been appointed chairman of the Committee on Arrangements for the 1953 Annual Meeting which will be held in New Orleans May 7-9 and he will appoint chairmen of the various subcommittees within a short while.

It is desired that plans for the scientific program for this meeting be initiated as soon as possible and the president of the Society has appointed the following sectional chairmen to arrange the program. Any member who wishes to participate in the program or to offer suggestions or recommendations concerning the program should contact the chairman of the respective section in which he is interested or Dr. C. Grenes Cole, 1430 Tulane Avenue, New Orleans, who is chairman of the Committee on Scientific Work.

ALLERGY—Dr. N. K. Edrington, New Orleans
BACTERIOLOGY & PATHOLOGY—Dr. John L. Beven, Baton Rouge
CHEST—Dr. Dwight S. Danburg, Greenwell Springs
DERMATOLOGY—Dr. M. T. VanStuddiford, New Orleans
DIABETES—Dr. Arthur A. Herold, Shreveport
EAR, NOSE AND THROAT—Dr. John J. Irwin, New Orleans
EYE—Dr. L. W. Gorton, Shreveport
GASTROENTEROLOGY—Dr. Daniel N. Silverman, New Orleans
GENERAL PRACTICE—Dr. Theo F. Kirn, New Orleans
GYNECOLOGY—Dr. Walter Levy, Jr., New Orleans
HEART—Dr. Edgar Hull, New Orleans
MEDICINE—Dr. Richard E. Selser, Baton Rouge
NEUROPSYCHIATRY—Dr. E. M. Robards, Jackson
OBSTETRICS—Dr. Simon V. Ward, New Orleans
ORTHOPEDICS—Dr. Lyon K. Loomis, New Orleans
PEDIATRICS—Dr. Roy E. de la Houssaye, New Orleans
PUBLIC HEALTH—Dr. S. J. Phillips, New Orleans
RADIOLOGY—Dr. Joseph P. Tomsula, Baton Rouge
UROLOGY—Dr. Eugene C. St. Martin, Shreveport

HEALTH INSURANCE PLANK REPUBLICAN PARTY PLATFORM

The following will inform you as to the position of the respective Republican and Democratic parties regarding their stand against and for Voluntary and Compulsory Health Insurance Plans.

We feel that the platform adopted by the Republican Party merits our consideration when we go to the polls in November.

"We recognize that the health of our people as well as their proper medical care cannot be maintained if subject to federal bureaucratic dictation. There should be a just division of responsibility between government, the physician, the voluntary hospital, and voluntary health insurance. *We are opposed to federal compulsory health insurance with its crushing cost, wasteful inefficiency, bureaucratic dead weight, and debased standards of medical care.* We shall support those health activities by government which stimulate the development of adequate hospital services without federal interference in local administration. We favor support of scientific research. We pledge our continuous encouragement of improved methods of assuring health protection."

HEALTH INSURANCE PLANK DEMOCRATIC PARTY PLATFORM

We will continue to work for better health for every American, especially our children. We pledge continued and wholehearted support for the campaign that modern medicine is waging against mental illness, cancer, heart disease and other diseases.

Research: We favor continued and vigorous support, from private and public sources, of research into the causes, prevention and cure of disease.

Medical Education: We advocate federal aid for medical education to help overcome the growing shortages of doctors, nurses, and other trained health personnel.

Hospitals and Health Centers: We pledge continued support for federal aid to hospital construction. We pledge increased federal aid to promote public health thru preventive programs and health services, especially in rural areas.

Cost of Medical Care: We also advocate a resolute attack on the heavy financial hazard of serious illness. We recognize that the costs of modern medical care have grown to be prohibitive for many millions of people. We commend President Truman for establishing the non-partisan commission on the health needs of the nation to seek an acceptable solution of this urgent problem.

SUGGESTED HEALTH PLANK FOR DEMOCRATIC PARTY PLATFORM, 1952 BY ORGANIZED MEDICINE

We recognize that the Nation's Voluntary Health Insurance Plans during the past four years have made remarkable progress in their efforts to provide the American people with sound, low-cost protection against the major costs of illness and accident. We also are cognizant of the fact that the majority of the American people, from all indications at the present time, does not favor a system of National Compulsory Health Insurance. We, therefore, in the interest of public welfare and in deference to public opinion, urge the maximum growth and development of Voluntary Health Insurance, and we hope that continued progress in that direction will prove conclusively that compulsory methods are unnecessary in the field of personal health care.

LOUISIANA STATE MEDICAL SOCIETY NEWS

CALENDAR

PARISH AND DISTRICT MEDICAL SOCIETY MEETINGS

Society	Date	Place
East Baton Rouge	Second Wednesday of every month	Baton Rouge
Morehouse	Third Thursday of every month	Bastrop
Natchitoches	Second Tuesday of every month	
Orleans	Second Monday of every month	New Orleans
Ouachita	First Thursday of every month	Monroe
Rapides	First Monday of every month	Alexandria
Sabine	First Wednesday of every month	
Second District	Third Thursday of every month	
Shreveport	First Tuesday of every month	Shreveport
Vernon	First Thursday of every month	

NEW RULING BY NARCOTICS BUREAU

We have just been informed that the Federal Bureau of Narcotics has sent out a new ruling on telephone orders. The ruling is as follows:

"Article 172—Bureau of Narcotics Regulations No. 5.

Telephone Orders: The furnishing of narcotics pursuant to telephone advice of practitioners is prohibited, whether prescriptions covering such orders are subsequently received or not, except that in an emergency a druggist may deliver narcotics through his employee or responsible agent pursuant to a telephone order, provided the employee or agent is supplied with a properly prepared prescription before delivery is made, which prescription shall be turned over to the druggist and filed by him as required by law."

All druggists are being alerted to this new regu-

lation and we in turn are giving you the information because it will make a difference to you in your practice.

SOME MOLES POTENTIALLY DANGEROUS

Although more than 99.9 per cent of all moles are harmless, some may turn into the worst kinds of cancer—highly malignant, very invasive and promptly fatal—Dr. Albert P. Seltzer, of Philadelphia, warned.

"Many people feel that just because a mole or other growth has been present since birth, it will never cause trouble," Dr. Seltzer wrote in Today's Health, published by the American Medical Association. "This is wishful thinking. We are all born with teeth, with tonsils, with an appendix. Yet frequently these organs become diseased and must be removed. The same is true of the common mole.

"Should every mole be removed? The answer is no. Most moles need no treatment except for cosmetic reasons. But certain kinds of moles are dangerous. A mole that increases in size, a mole that bleeds readily, a mole that becomes irritated or inflamed may already have become cancerous and certainly should come out at once."

Dr. Seltzer pointed out that black moles, particularly blue-black, green-black or slate colored ones, are prone to become malignant. Moles on the foot are quite dangerous and should be removed, as should moles in places exposed to constant irritation or chafing, such as along the collar line, in the shave area of the face, on the lips of a pipe smoker, along the belt line or in the armpit.

On the other hand, he added, cancer seldom originates in a mole that is brown or has hairs growing from it.

YOUR MONEY'S WORTH IN HEALTH

A new pamphlet entitled, "Your Money's Worth in Health," will be distributed soon to each member of the A.M.A., from the Public Relations Department of the national headquarters. It is an excellent explanation of some of the money troubles plaguing your patients and what part of his dollar goes for medical attention. The pamphlet points out that today a patient spends only 4% of his income for medical care (the same as his parents), while the percentage of his dollar that goes for other things is greatly increased. It also points to the fact that the doctors' share of a patients medical dollar is actually less than in 1935-1939, due to a sharp rise in other medical costs but only a minor increase in doctors' fees. Additional copies of "Your Money's Worth In Health," will be available from the Public Relations office of the State Society.

NEW DESSERTS REMOVE EXCESS SALT

At the recent convention of the American Medical Association, visiting physicians made thousands of taste tests of cookies into which there had been baked a mixture of unflavored and finely ground sodium-removing resins. The doctors approved the medicated cookies for taste; many believed they compared favorably with grandma's best. Cookies are but one foodstuff into which the housewife may blend this new form of an already established agent which removes excess sodium from the bodies of patients who suffer from heart disease, cirrhosis of the liver, edema of pregnancy, or hypertension. Fruit juices, milk, fudge, cake, and flavored gelatin are some of the other nutriments which will hold and disguise the new medication. Now patients with excessive sodium retention can actually enjoy taking a medicine which allows other items in their diet to be seasoned more liberally and tastefully with once-forbidden salt. Eli Lilly and Company will supply physicians with books of various kitchen-tested recipes which may be given to patients.

ANNOUNCEMENT OF VAN METER PRIZE AWARD

The American Goiter Association again offers the Van Meter Prize Award of Three Hundred Dollars and two honorable mentions for the best essays submitted concerning original work on problems related to the thyroid gland. The Award will be made at the annual meeting of the Association, which will be held in Chicago, Illinois, May 7, 8 and 9, 1953, providing essays of sufficient merit are presented in competition.

The competing essays may cover either clinical or research investigations; should not exceed three thousand words in length; must be presented in English; and a typewritten double spaced copy in duplicate sent to the Corresponding Secretary, Dr. George C. Shivers, 100 East Saint Vrain Street, Colorado Springs, Colorado, not later than February 15, 1953. The committee who will review the manuscripts is composed of men well qualified to judge the merits of the competing essays.

A place will be reserved on the program of the annual meeting for the presentation of the Prize Award Essay by the author, if it is possible for him to attend. The essay will be published in the annual Proceedings of the Association.

FISKE FUND PRIZE DISSERTATION

The Trustees of the Caleb Fiske Fund of the Rhode Island Medical Society announce the following subject for the prize dissertation of 1952:

"The Present Status of Anti-Coagulant Therapy"

For the best dissertation a prize of $200 is offered. Dissertations must be submitted by December 1, 1952, with a motto thereon, and with it a sealed envelope bearing the same motto inscribed on the outside, with the name and address of the author within. The successful author will also agree to read his paper before the Rhode Island Medical Society at its Annual Meeting on May 7,

1953. Copy must be typewritten, double spaced, and should not exceed 10,000 words. For further information write the Rhode Island Medical Society, 106 Francis Street, Providence 3, R. I.

INTERNATIONAL MEETING ON RABIES CALLED BY WHO

The first international meeting on rabies called by the World Health Organization will take place in Coonoor, India, from 14 to 28 July.

Important rabies carriers are dogs, cats, wolves, jackals and foxes, as well as the mongoose, meercat and genet in South Africa, and the vampire bat in South and Central America.

Recent important advances in the study of rabies include the introduction of the mouse as an experimental animal for detecting the virus, the development of new and potent vaccines, and the use of hyper-immune serum in the prevention of the disease.

WHO has sponsored a series of rabies surveys in different countries, aided Israel in the vaccination of dogs, and assisted Mexico in a project involving vampire bats. As a follow-up to the Coonoor conference, the various discussion leaders will visit laboratories and give technical advice in Indonesia, Thailand, Burma, Malaya, India and Iran.

In preparation for the conference, a Reference Manual on Rabies has been prepared by WHO with the help of these experts. The manual contains detailed descriptions of laboratory techniques as well as methods of field control. Demonstration material and standard virus strains will be distributed to the participants.

SURGICAL ASSOCIATION OF LA. CHANGES MEETING DATE

The Surgical Association of Louisiana will hold its annual meeting at the St. Charles Hotel, New Orleans, on Sunday, November 16. An excellent scientific meeting is being planned. Please remember the date and enjoy good food and an all-round good time.

BOOK REVIEWS

Atlas of Genito-Urinary Surgery: By Philip R. Roen. New York, Appleton-Century-Crofts, Inc. 1951. illus. pp. 325. Price $8.00.

To my knowledge no atlas of genitourinary surgery existed prior to the publication of this book. For this reason alone, it would appear that this work represents a very worthwhile contribution to the literature.

As the word atlas implies the book is made up chiefly of illustrations. With each operative procedure there is a brief word description in outline form. The volume is divided into nine sections or chapters covering all phases of genitourinary surgery.

In the introductory chapter the author comments upon general surgical and urological principles with special emphasis being given to the preparation of the patient for surgery. He also mentions some very important postoperative principles that are worthwhile.

Sections two, four and five deal with surgery of the kidney, ureter, and bladder, respectively. Each section covers its field rather completely, an where variations in techniques are justified, each technique is illustrated. In dealing with ureteral surgery emphasis is placed on the various routes and techniques for ureteral transplants.

Section three is devoted to the surgical considerations of the adrenal gland. Techniques for perirenal air insufflation and pneumoretroperitoneum are also outlined.

Prostatic surgery is covered in section six and operations on the scrotum and testicles are considered in section seven. Surgery of the urethra and penis is covered in the last two sections. Special attention, showing several different techniques, is given to the surgical correction of hypospadias.

Each urologist has developed certain surgical techniques and certain minor variations in standard techniques, so it is not within the scope of this review to comment on any specific operative methods. As a general comment, however, I should like to say that in many of the procedures details in anatomy and technique are missing. I realize the author has sacrificed such details for brevity and conciseness, and for this he is to be commended. However, for one who is not familiar with a certain procedure this atlas in itself does not appear to be the answer to the entire problem.

It is felt that this atlas represents a very important part of any urological library. I believe its use in conjunction with other urological texts and operative descriptions will be very beneficial to anyone interested in genitourinary surgery.

R. P. Morrow, Jr., M. D.

PUBLICATIONS RECEIVED

Medical Research Press, N. Y.: The Low Fat Diet Cook Book, by Dorothy Myers Hildreth, Dietitian, and Eugene A. Hildreth, M. D.

W. B. Saunders Company, Phila.: Pharmacology in Clinical Practice, by Harry Beckman, M. D.

Charles C. Thomas, Publisher, Springfield, Ill.: Diabetic Glomerulosclerosis; The Specific Renal Disease of Diabetes Mellitus, by Harold Rifkin, M. D., Louis Leiter, M. D., Ph.D., and James Berkman, M. D.; Disorders in Perception, by Morris B. Bender, M. D.